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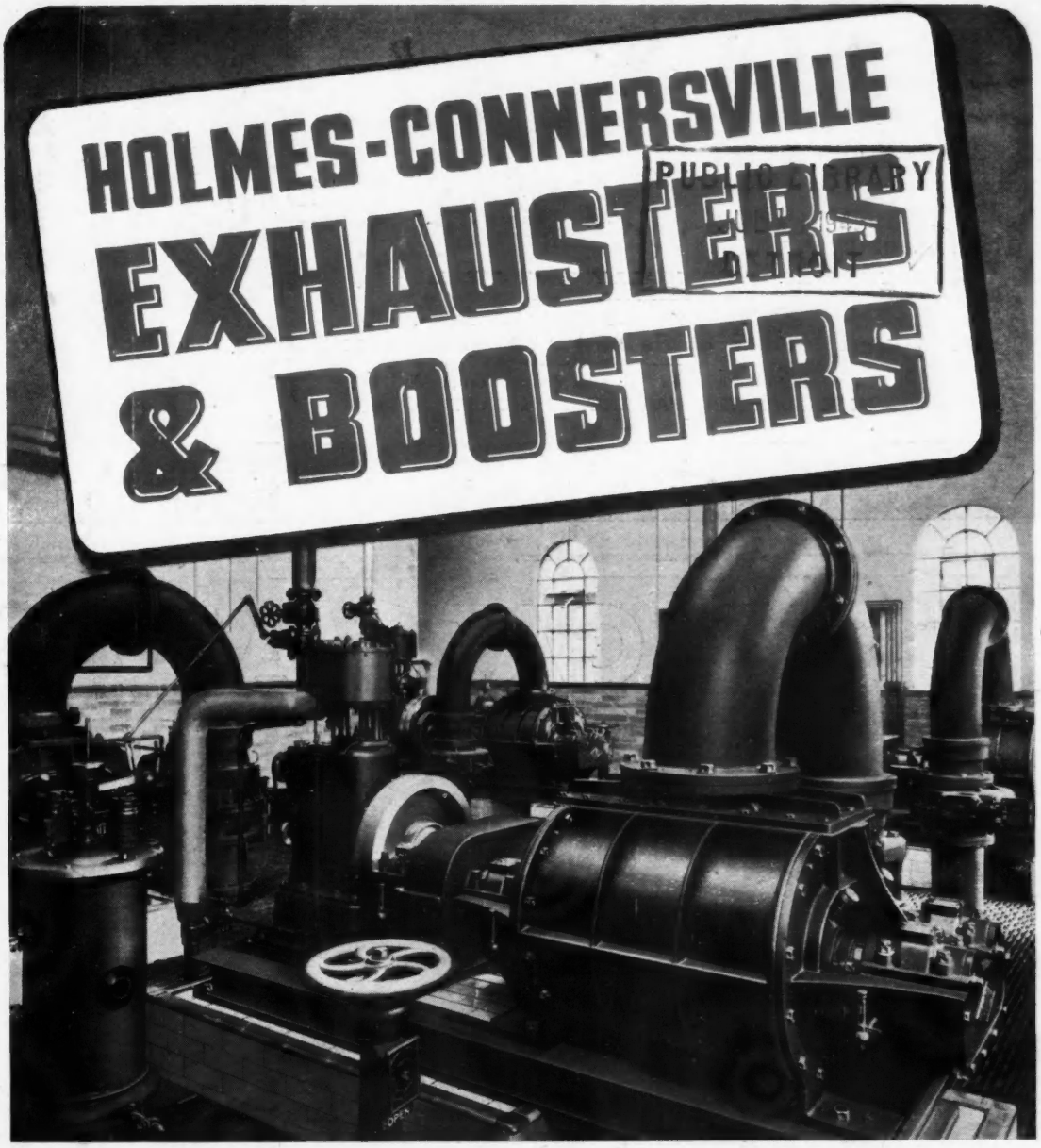

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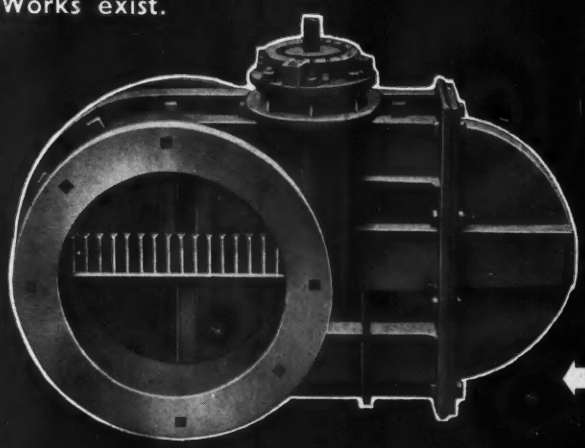

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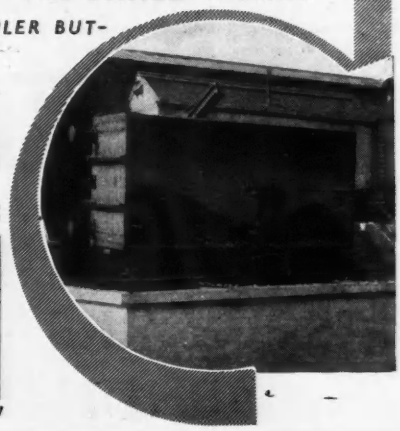

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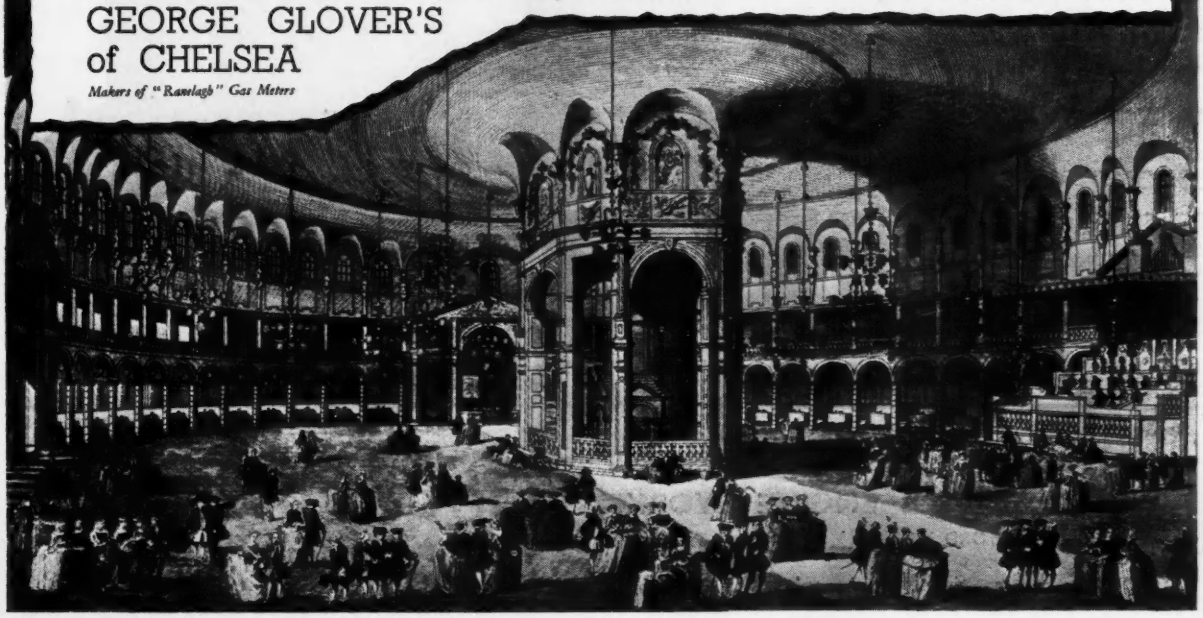

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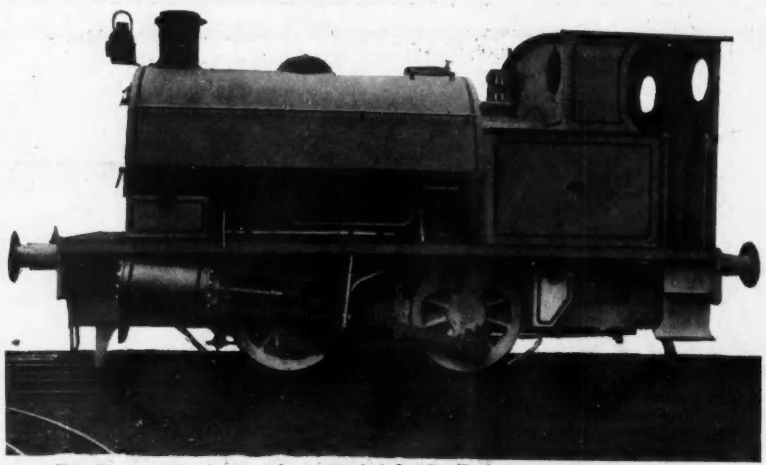

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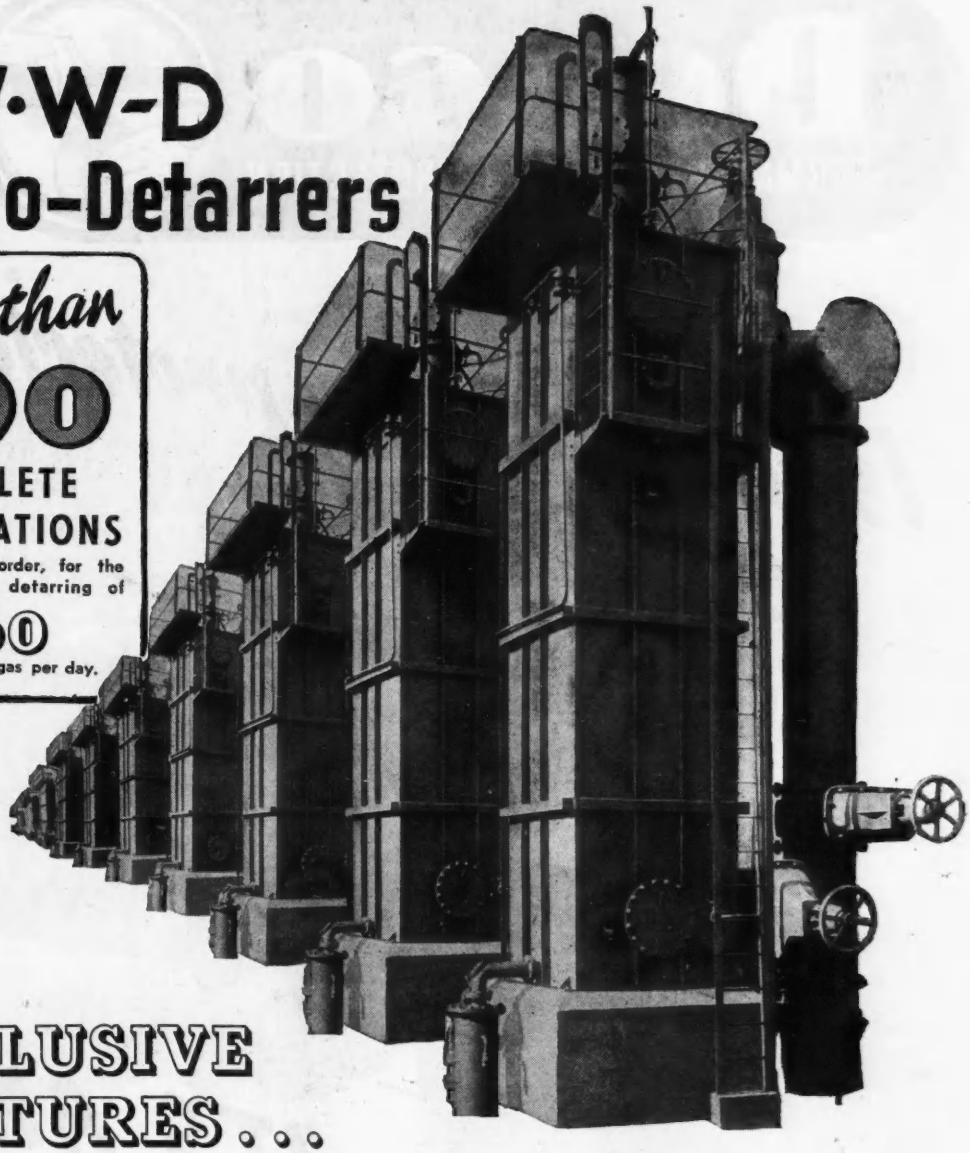

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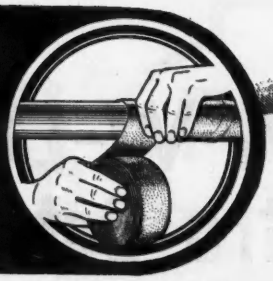

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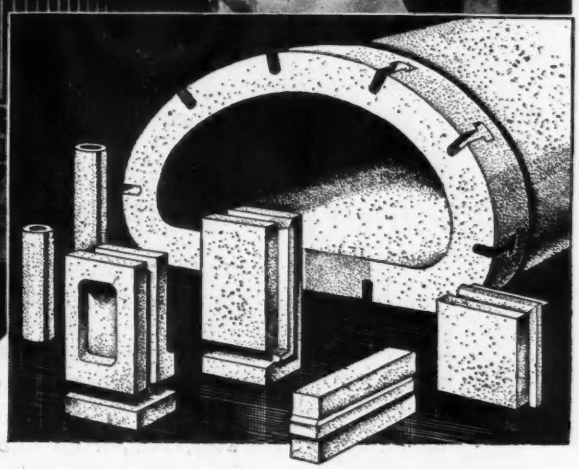

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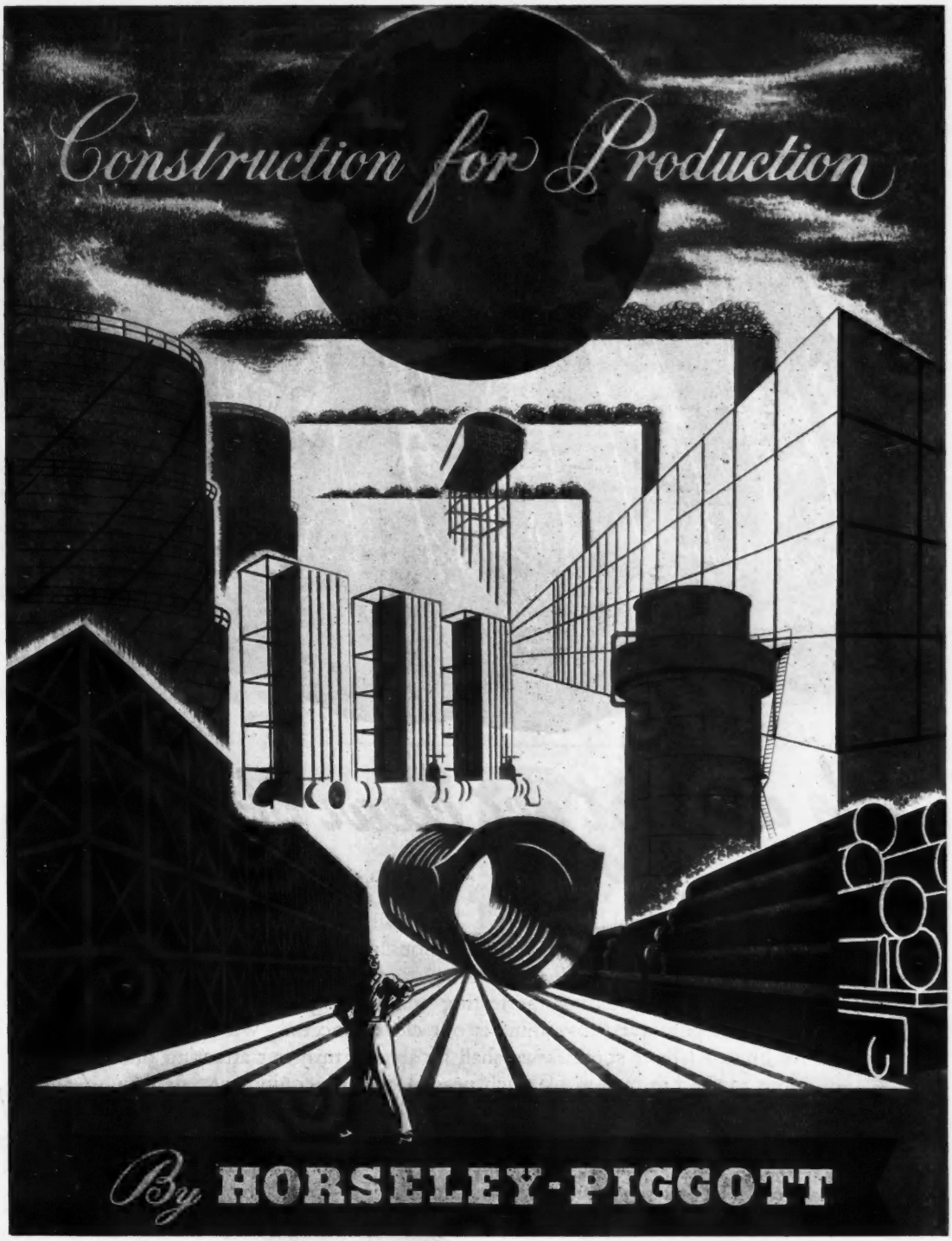

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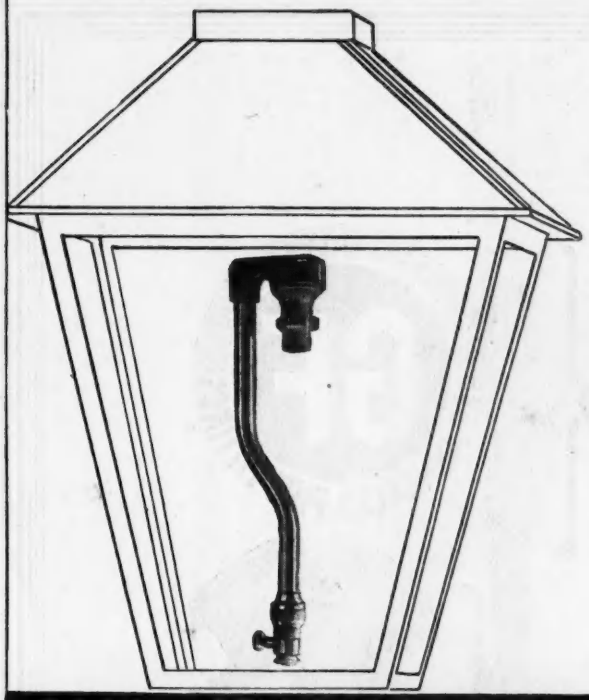

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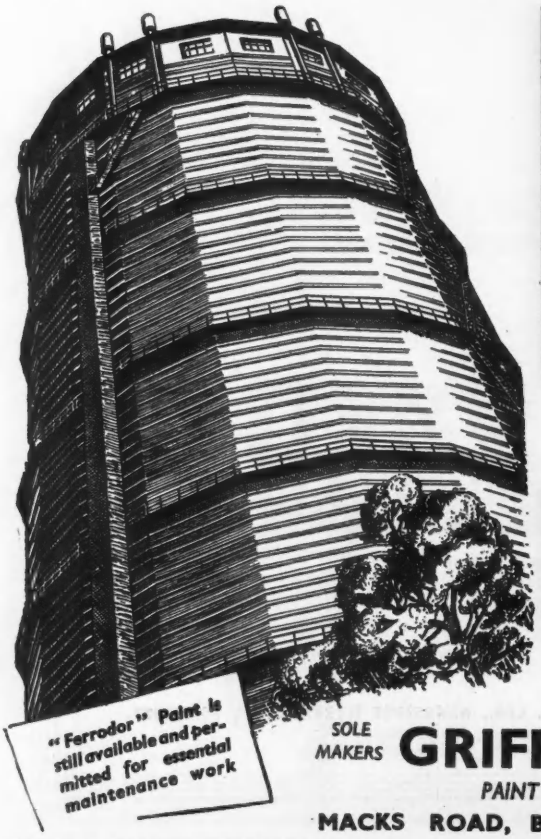

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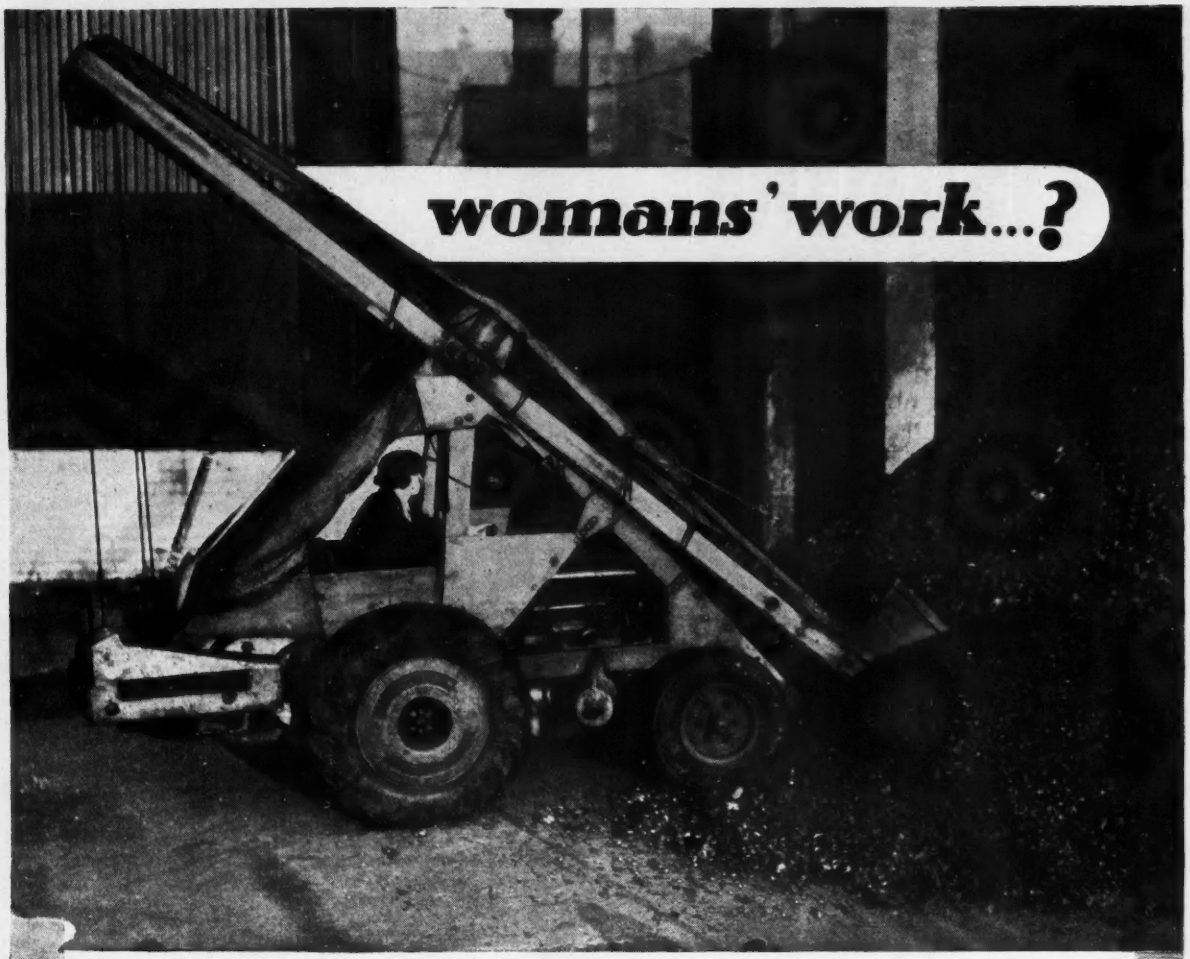

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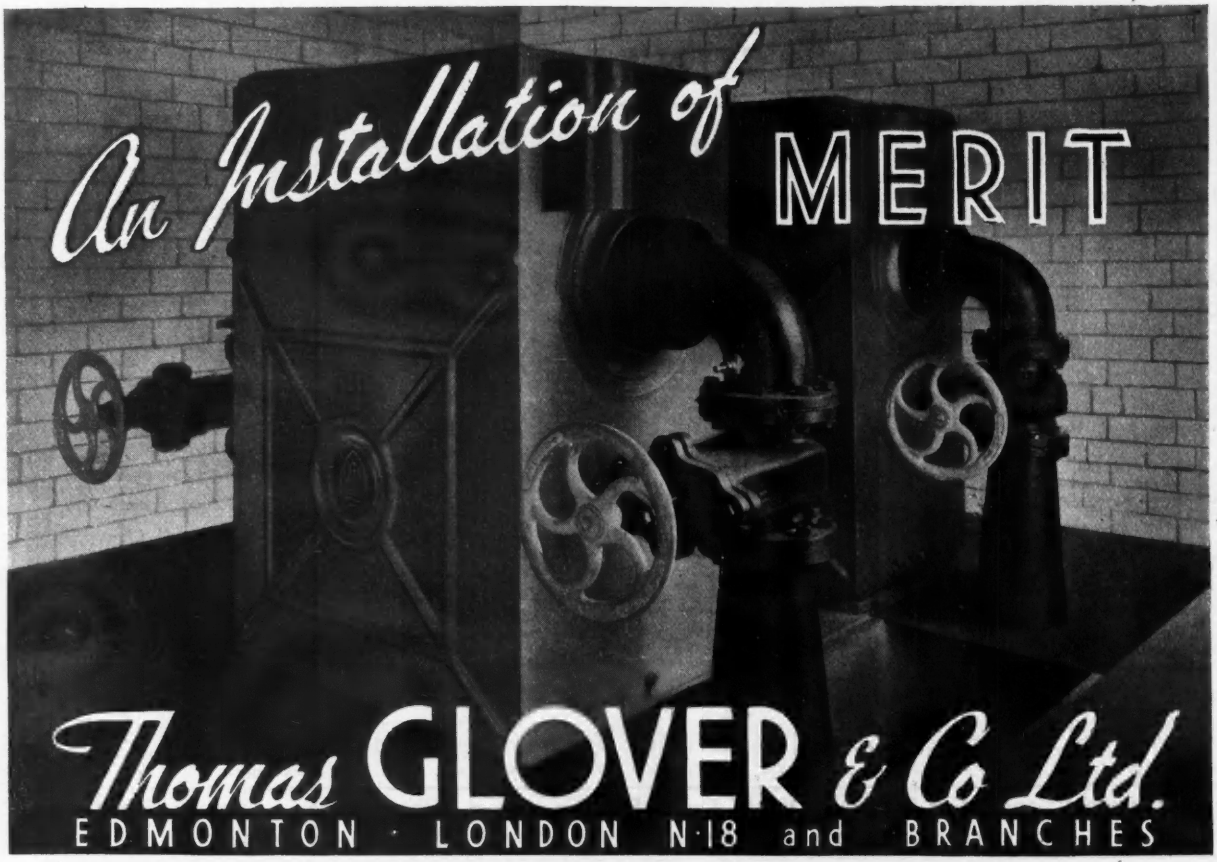
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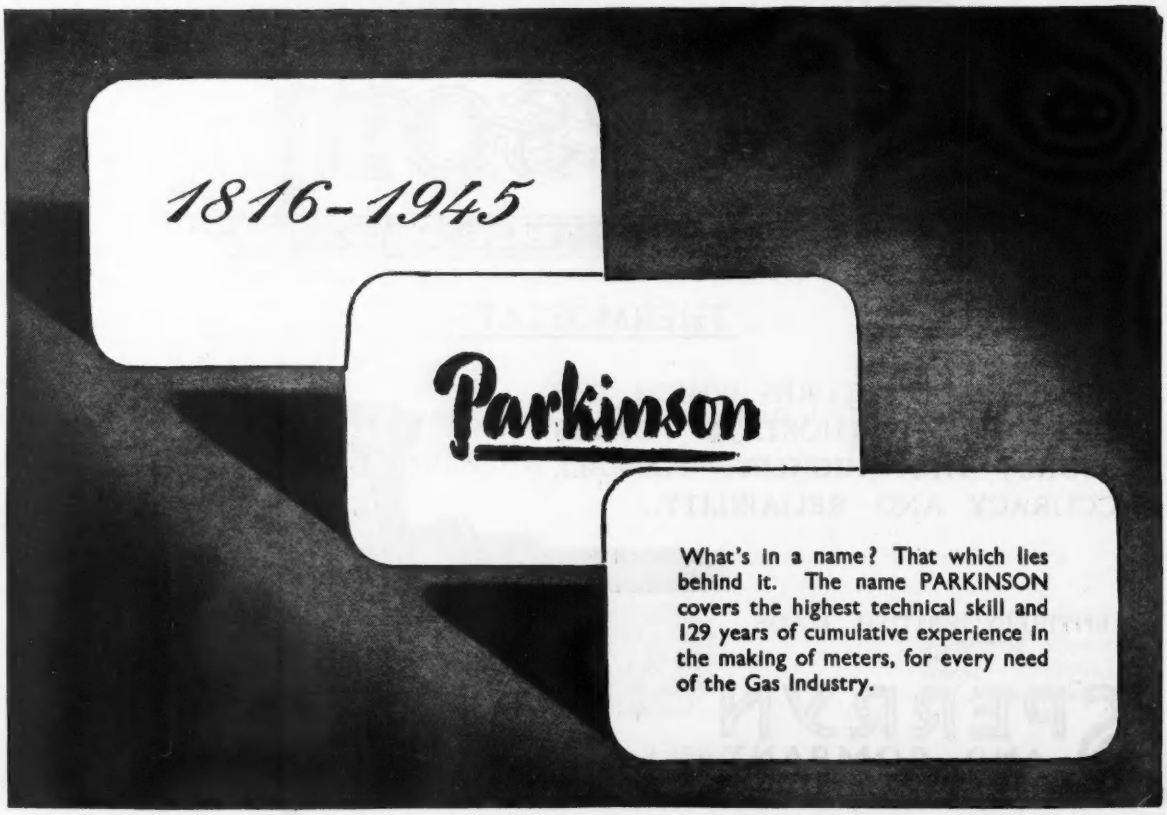
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GAS JOURNAL, JUNE 27, 1945

VOL. 245 97th YEAR No. 4284

EDITORIAL NOTES

INSTITUTION RETROSPECT

IN last week's issue of the "JOURNAL" we recorded in brief the two-day Victory Institution meeting which, as regards business transacted, was as full and complete, we think, as any pre-war Institution meeting. We are speaking of the period between the two wars, when the three-day gatherings gave alike a needed break in the business and technical proceedings, and a chance for the ladies to join in pleasant excursion and the President to T.C.P. an overworked throat. Looking back, we regard what we consider as a definitely overworked meeting of the Institution this year with intense admiration for all concerned in its success—for it was most certainly marked by success—with a sense, indeed, of awe, yet at the same time with a feeling of misgiving. How admirable, it may well be argued, to contrive to contain a quart in a pint pot; but is it not somewhat of a strain to attempt to make an egg-cup—at the present juncture—a fitting receptacle for a couple of quarts or more of dehydrated egg? Not that we are insensitive to the spirit behind what we would again stress in all sincerity was a successful meeting, in which the President, Mr. Whitehead, played at one and the same time an unassuming yet powerfully guiding role, carrying with him in harmony all present (no light task, and one demanding a confidence unattainable by exercise, however adroit, of mere cleverness), but that, in spite of the 1939–1945 years, there seemed to us an element of sameness not accounted for by the inevitable staleness of mind symptomatic of war strain. There appeared to us to be a desire to accomplish something entirely worthy in itself, yet something essentially for its own sake. Perhaps we had hoped for too much. Maybe we had anticipated a soupçon of spontaneity, a surge of new thought, less all-too-obvious regimentation in discussion, shorter and crisper communications more befitting the times—in brief, a little of something new, a little of something which the Institution should have.

We do not claim that "JOURNAL" thoughts are not more liable to mosquito bites than was the heel of Achilles. Indeed we are, as this issue shows, endeavouring to accommodate a technical magnum into a journalistic thimble. But what a technical magnum!—even though this gaseous magnum is a droplet only compared with the paper-mills' election waterfall. Still, as the auditors are wont to say, one must strike a balance; and certainly the communications submitted at this month's Institution meeting lacked nothing in length. Is it a question of inter-institution or even international competition; or is it that papers by quartets or more of authors necessitate corresponding space ratio; or do these questions constitute pure carping? The thousands of Institution words which we publish on later pages are indeed index that we are not in the least under the impression that these thousands of words are heedless. They are by no means inconsequential, but they do constitute a flood, in very truth a glory bath for the enthusiasts. For good or ill, and it may be a matter of manners or method, the Institution gardener has not yet devised or been instructed to use a technical pruning knife. The limitation on the number of words per communication imposed during the past six years has been swept away with a vengeance. Let us hope that wisdom within the communications will duly expand with this lifting of Institution control.

We hold the view, reinforced by further study of the communications presented, that the 1945 meeting of the Institution of Gas Engineers was technically strong, imaginatively progressive rather than an account of past technical achievement, factually satisfying in point of wartime record, but, unfortunately, from every point of view, and not from our own only, wordy in the extreme. Our impression was that, again for good or ill, there was positive re-enactment and re-entrenchment of pre-war Institution business procedure and tradition. True, the meeting this month, marking European victory (whatever the consequence of this victory), staged an innovation in "Question Time," a full report of which innovation we give in our columns to-day. Naturally we asked many people who attended the Institution meeting what they thought about this new feature, and our assessment of the views we gathered is that, on balance, it was a popular feature. If it was popular, no doubt our report will be read avidly. But it seemed to us a most ordinary ("ordinary" in the Institution sense) hour and a half or so of stereotyped prearranged discussion at times verging on the presentation of a series of potted theses—and not too exciting at that—by acknowledged experts. It seemed to us all very worthy but very dull. Yet the innovation presented an opportunity for something lively and intellectually entertaining. Far be it from us to ask for music-hall or intimate review at an Institution meeting. Dignity must have both its place and its devotees; and it is accorded both by the Gas Industry's professional body. But "Question Time" did not seem to us particularly sparkling as a new venture, though many readers may discover the sparkle we failed to discern.

Personal

Professor D. T. A. TOWNEND, D.Sc., Ph.D., Livesey Professor of Coal Gas and Fuel Industries at Leeds University, has accepted an invitation from the Council of the British Coal Utilization Research Association to the Directorship of the Association. Educated at Bancrofts School, Professor Townend held an Exhibition at the East London (now Queen Mary) College, where, after war service in the R.N.A.S. and R.A.F., he graduated in 1920. Following post-graduate study in Fuel and Chemical Engineering at the Imperial College of Science and Technology, he was associated there for many years with the late Professor W. A. Bone and Dr. (now Professor) D. M. Newitt in investigations into combustion and high-pressure problems, and held successively a Salters Research Fellowship and a Rockefeller International Research Fellowship. Professor Townend has occupied the Livesey Chair for seven years, and has served on the Council of the Gas Research Board since its inception in 1939. He is an Honorary Member of the Institution of Gas Engineers, and Chairman of the Yorkshire Section of the Institute of Fuel. During the war he has served on a number of Government Committees, and his Department has made notable contributions to the war effort.

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Mr. L. P. INGRAM has been appointed General Manager of the Taunton and District Gas Company, and his place as Engineer and General Manager of the Bognor and District Gas and Electricity Company will be taken by Mr. A. G. I. Anderson, Director, General Manager, and Secretary of the Shotley Bridge and Consett District Gas Company, the appointments to become effective when the necessary arrangements have been made.

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The Chairman of the Prescot and District Gas Company, Mr. W. A. CROSS, whose family have been connected with the Company for upwards of 100 years, has been appointed in the King's Birthday Honours a Member of the British Empire.

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Mr. J. DAVIDSON PRATT, General Manager of the Association of British Chemical Manufacturers, has been released by the Minister of Supply, with effect from June 1, 1945, from the appointment of Controller, Chemical Defence Development, which he has held since May, 1940, to resume his former duties with the A.B.C.M. and its affiliated Associations.

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At Heckington, Lincs, on June 12, a presentation was made to Mr. G. E. SHEARMAN, Gas Manager, in appreciation of his services during the past 7½ years. He was wished every success in his future work at Southwell, Notts.

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Mr. A. H. SAVILL, M.Sc., has been appointed Chief Chemist to the Wandsworth and District Gas Company with effect from June 18.

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Major H. R. KILNER, M.C., Managing Director (Aviation) of Vickers-Armstrongs, Ltd., has joined the Board of Vickers, Ltd. Mr. L. I. G. LEVESON, B.Sc., has been appointed a Director of Vickers-Armstrongs, Ltd.

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The wedding took place on Saturday, June 23, at Lexden Parish Church, Colchester, of Lieut. GEORGE EDWARD SAWYER, R.N.V.R., son of Mr. and Mrs. G. E. Sawyer, of Sutton Coldfield, Warwickshire, and NANCY KING, W.R.N.S., daughter of Captain and Mrs. C. A. King, Kemp Cottage, Fitzwalter Road, Colchester.

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Captain CLIFFORD KING is due for demobilization in Group 1, and we hope to have him back with us before long.

Obituary

Mr. JOHN S. OFFICER, Secretary to the Montrose Gas Company, Ltd., has died in his 81st year.

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The death occurred on June 15, after a prolonged illness, of Mrs. Cross, wife of Mr. D. C. Cross, Engineer and Manager of the Lea Bridge District Gas Company.

Correction.—The Members of Council elected at the annual meeting of the Scottish Junior Gas Association (Eastern District) were as follows: W. Masterton, Edinburgh (*ex-officio*); R. Air, Cowdenbeath; A. Doran, Edinburgh; C. B. Mitchell, Dunfermline; W. H. Carson, Edinburgh; and D. Gillespie, Cardenden—and not as stated in our report on p. 783 of the "JOURNAL" of June 20.

New Glover-West Plant at High Wycombe

On Wednesday last the Mayor of Chepping Wycombe, Mr. J. R. Avery, officially inaugurated new carbonizing plant, consisting of an installation of Glover-West continuous vertical retorts, and ancillary plant, at the High Wycombe Works of the Uxbridge, Maidenhead, Wycombe, and District Gas Company. The installation has a gas-making capacity of 1½ million cu.ft. a day, and a special feature is its pleasing architectural appearance.

Following the inspection of the works, the company of visiting gas engineers and local civic representatives adjourned to the Red Lion Hotel for luncheon, over which Major JULIAN DAY, M.C., presided.

The toast of "The Borough of Chepping Wycombe" was proposed by Sir FREDERICK J. WEST, K.B.E., J.P. (Chairman, West's Gas Improvement Company, Ltd.), who paid a tribute to the voluntary services rendered by those associated with local government in this country. He had had the privilege of studying local government in many countries of the world, and he had come to the definite conclusion that there was no form of government in any part of the world —either national or local government—which was superior to that of Great Britain. It was built on the solid foundation of integrity and honesty of purpose, and was carried on in the very best interests of the community by people who were genuinely anxious to serve their fellow citizens. It was appropriate therefore that on the occasion of the inauguration of the new plant at the gas-works, they should have such an excellent representation from the local authority.

Responding, Councillor J. R. AVERY, J.P., said they had had demonstrated to them that day a lesson which he hoped they would all appreciate—the progressive character of the Gas Industry and the interdependence of all local services one with the other. It was obvious that the Gas Industry had spent a good deal of time developing ideas, and on behalf of his colleagues and all the townspeople he thanked them for the privilege of seeing their new gas-works and for the hospitality accorded to them.

The toast of "The Gas Company" was given by Mr. Philip B. BEECROFT, LL.B. (Town Clerk), who said the day could well be considered a red letter day in the annals of the local Gas Company, and he was sure they would all have realized that in Mr. Dyde they had an Engineer and General Manager who had brought ingenuity and energy to bear in introducing new plant which would be to the advantage of the town. When the new works were mooted a public enquiry was held, at which Mr. Dyde gave evidence. At that enquiry things were promised which had been done, notwithstanding the great shortage of labour and materials. He was sure that it was a good beginning; he was equally certain that it was not going to be the end. The new buildings and what they proposed in the future would fit in well with the Council's improvements to the amenities of the district around the gas-works. The invitation to the representatives of the local authority to attend that day did emphasize that they recognized that the Council was interested in everything that appertained to the welfare of the population. It was a gesture of goodwill and co-operation between all public utility undertakings. In conclusion, the speaker paid a tribute to Mr. W. W. Chissolm, the Works Manager during the erection of the plant, who had now been promoted to another undertaking, and who, while he was at High Wycombe, earned the respect of all. They extended to Mr. J. R. Owens, his successor, every good wish, and looked for the same helpful co-operation.

Major JULIAN DAY, in his reply, apologized for the absence of the Chairman of the Company, Sir David Milne-Watson, who had not been in good health recently. He went on to refer to the policy of the South-Eastern Gas Corporation of absorbing neighbouring gas undertakings to increase efficiency. He thought that they would all agree that in entrusting the work of reconstruction at High Wycombe to the firm presided over by their distinguished guest, Sir Frederick West, they had done all they could to provide a gas-works which had definite architectural merit. Even so, that was only the first stage of the developments. He had considerable sympathy with Mr. Dyde's proposals for the disappearance in due course of a particular portion of the old works, and its replacement by something much more worthy of its next-door neighbour—the new retort house. On behalf of his co-Directors and all officials of the Company he wished to thank His Worship the Mayor and all the members of the Council for their presence, and for the cordial expressions made on the provision of the new plant.

The toast of "The Guests" was proposed by Mr. J. H. Dyde, M.Sc., who welcomed the many guests who had honoured them with their presence at the works and at the subsequent luncheon. They did not intend, he said, that their High Wycombe Works should lag behind any of the larger works in gas carbonizing technique. After referring to the civic representatives and officials present, Mr. Dyde mentioned that among others present they were delighted to have the company of Mr. George Evetts, O.B.E. (Gas Adviser to the Ministry of Fuel and Power), Mr. W. K. Hutchison (Director of Compressed Gases at the Air Ministry), Mr. Harold Baker, formerly Manager of the High Wycombe Works, and Mr. H. A. Probin and Mr. Sandford Smith, of the South-Eastern Gas Corporation. Mr. Dyde mentioned, in conclusion, the hydrogen plant at High Wycombe which, during

the fly-bomb attack, was working at high pressure to keep the balloons flying.

In his response to the toast, Mr. GEORGE EVETTS referred to the high technical efficiency attained by the Gas Industry in that area since he started his association with the old Uxbridge Gas Company 40 years ago. In spite of everything done in that direction, however, the next winter was going to be a very difficult one. It was going to present a severe task to all gas managers owing to shortage of coal, labour, &c., and therefore everyone should be as careful as possible in their use of gas.

Gas Undertakings' Results

Hornsey Gas Company.—As the result of the year's working, £29,216 is carried to net revenue account, and dividends have been declared at the rate of 5½% on the 5% stock and 4% on the 3½% stock, leaving £11,390 to be carried forward compared with £14,089 brought in. Receipts from gas sales were up by nearly £9,000 as the result of the increased quantity sold, the price having remained at 12.2d. per therm throughout the year. Early in the war the population of Hornsey was reduced by about a third owing to evacuations, bringing about a serious fall in the consumption of gas. Heavy raids in 1940–41 brought about further evacuation, and the lowest level of sales was reached in 1941, when the quantity sold was 26½% below the sales for 1939. Since then people have been returning to the area, but the sales for 1944 were still 8.7% below 1939. Although there was a great deal of damage from enemy action in the area, there was only minor damage at the works, and gas-making continued throughout the war without interruption, though supplies were at times upset through damage to mains and services.

Imperial Continental Gas Association.—The report for the year ended March 31 states that during the year contact was re-established with the Association's interests in Belgium and France. Most of the Belgian and French undertakings paid dividends throughout the war, a proportion of which was paid over to the German Custodian of Enemy Property. In Belgium 48,600,254 B.Frs. was paid to the custodian and is now subject to negotiations. It is believed that a substantial proportion will be recoverable. In addition, 75,607,906 B.Frs. was available in Belgium, of which 73,820,926 B.Frs., equivalent to £417,135, has been received in this country and is incorporated in the accounts. In France 40,582,823 F.Frs. was paid to or controlled by the custodian, of which 32,142,500 F.Frs. was released to meet a call on shares of the Cie Continentale du Gaz. It is expected that the balance, equal to about £42,000, will be recoverable from the French authorities. No remittances have been received from France and no French revenue is included in the accounts. The accounts show that revenue attributable to the year to Mar. 31, 1945, was £243,851, against £131,944 for the previous year, to which is added £309,329 attributable to previous years. Income for previous years, amounting to 50,387,234 Belgian Frs. and 40,582,823 French Frs., which is at present blocked, has not been included. Profit, after providing for taxation, &c., was £243,936, to which is added a balance brought forward of £235,197. The Directors recommend an Ordinary dividend of 3½% and a special dividend of 6½%, making 10% for the year, leaving £199,133 to be carried forward. The previous dividend was for 1939–40.

Peterborough Gas Company.—At the annual meeting on May 29 the Directors reported that dividends of 5% on the new Preference "A" shares and 7½% on the Consolidated Ordinary shares, less tax, had been paid for the half-year to September, 1944, and similar dividends were declared for the past half-year, leaving a balance of £5,677 to the credit of profit and loss account. Gas sales at 2,969,699 therms showed an increase of 67% over the year 1939–40. From the March meter readings the price of gas would be reduced by ¼d. per therm to ordinary consumers and by 0.85d. per therm to prepayment consumers. In spite of war difficulties a full reconstruction programme had been carried through. The Directors were authorized to raise the remaining loan capital of the Company of £63,287 by the creation and issue of Debenture stock bearing interest at 4% per annum.

Plymouth and Stonehouse Gas Light and Coke Company.—Net profit for the year to March 31 was £12,145, against £44,974 for the previous year, the reduction being attributable partly to the effect of income tax liability and increased provision for deferred repairs, the latter taking £14,000, against £6,000 for 1943–44. The carry-forward is £55,697, compared with £71,210 brought in. At the annual meeting on June 28 the Directors will recommend final dividends of 2¼% (actual) on the Ordinary stock (making 5⅜% for the year), 9s. per share on the Additional shares (making 16s. 6d.), and 8s. 6d. per share on the New shares (Act 1879) (making 15s. 6d.), less tax. For transferees to receive these dividends transfers must be lodged not later than June 11.

Rochester, Chatham, and Gillingham Gas Company.—Net revenue for the year to December, 1944, after providing for debenture interest and other expenses, amounted to £28,144, and a final dividend of 7½% makes a total of 7% for the year, the same as for 1943, leaving £35,141 to be carried forward, compared with £34,520 brought in. Gas sales last year amounted to 7,733,168 therms. Summarized details for the years 1940–43 included in the accounts show that the gas output, which was reduced at the beginning of the war, has been increasing since, and it is now substantially above the pre-war level. In addition to meeting the demands of its own consumers the Company has continued to supply the Sittingbourne Gas Company with gas in bulk, and a small bulk supply is being given to the Sheppey Gas Company. During the cold weather at the beginning of the present year the quantities of gas made and sent out were the highest ever reached by the Company.

South Midland Gas Corporation.—Profit for the year ended March 31, after charging income tax and all other expenses, was £5,851. At the annual meeting on May 24 a final Ordinary dividend of 2½% was declared, making 5½% for the year, and a balance of £1,992 was carried forward, against £1,722 brought in.

Tunbridge Wells Gas Company.—Dividends of 5% on the maximum stock and 7½% on the Sliding Scale stock were declared at the annual meeting on April 26. The balance carried to net revenue account was £15,209, and £23,053 is carried forward, compared with £23,473 brought in from the previous year. Gas sales amounted to 2,885,927 therms, compared with 2,713,864 therms in 1943 and 2,543,400 therms in 1940. At the beginning of the war there was a tendency for gas sales to decrease on account of consumers moving away from the area, but this was soon more than made good by an influx of people from London and the coastal towns, and by the establishment of various Government and other offices in Tunbridge Wells. As a result, the quantity of gas sold has shown a steady increase year by year, the quantity sold in 1944 being 20% more than in 1938. This increase in sales has helped in keeping down the price of gas. Despite large increases in the cost of coal, wages, and other costs, the present price of 1s. per therm is only 20% above the price in 1938.

Wellington (New Zealand) Gas Company.—A dividend of 6%, the same as for the previous year, has been declared for 1944, the 75th year of the Company's activities. The net profit for the year was £20,074, and a balance of £14,656 is carried forward. In his address to the shareholders, Dr. C. P. Knight said that for the first year in the history of the Company the sales of gas exceeded 1,000 million cu.ft., the actual figure being 1,006 million cu.ft., an increase of 83 million cu.ft. over 1943, showing a rise of 38% over 1938. The erection of the third unit of Glover-West plant, consisting of 16 retorts, was completed in February, 1944, and gas-making commenced in April. Capital expenditure for the year amounted to £20,597, and further heavy capital expenditure would be required for additional manufacturing plant.

Diary

June 30.—Manchester and District Junior Gas Association: Ladies' Day, Southport.
July 6.—Manchester District Association of Gas Engineers: President's Day, Rochdale.
July 10.—Federation of Gas Employers: Ventral Committee, Gas Industry House, 11.30 a.m.
July 10.—British Gas Council: Gas Industry House, 2.30 p.m.
July 12.—Solid Smokeless Fuels Federation: Technical Committee, at Gas Industry House, 10.30 a.m.

"**Ex-Baillie Purves,** Cupar, criticizing the £6,000 local electricity street lighting scheme, will give £5 to any charity if Alva—lit by gas—is not the best lit road stretch (Stirling excepted) between Cupar and Glasgow." This announcement was made in the *Scottish Sunday Express* of June 17.

The Manchester District Association of Gas Engineers will observe President's Day on July 6 with a visit to Rochdale, where, after luncheon as the guests of the Mayor and the Gas Committee, they will visit the gas-works, of which Mr. C. H. Bamber, President, is Engineer and Manager.

In His Statement for the general meeting of Newton Chambers & Co., Ltd., Sir Samuel Roberts, Chairman, referred to the sale of the Company's tar business to Yorkshire Tar Distillers, Ltd., He added that, though Thorncliffe Coal Distillation, Ltd., had not yet resumed dividends, it was once again on a profit-earning basis and the reconstruction programme should be completed within the next few months.

Mr. R. H. Stein has relinquished his position with Messrs. Braithwaite & Company (Engineers), Ltd., and has given up all his other business interests in order to take charge at the Ministry of Works of the production of prefabricated permanent houses.

On June 4 a talk was given by Mr. R. K. Adams, of the Parkinson Stove Company, Ltd., to members of the sales, distribution, and maintenance staffs of the Liverpool Gas Company. Technical problems dealing with hot water supply by gas heated circulators were dealt with, and some interesting suggestions were made and considered during the discussion which followed the talk.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Question and Answer

A New Feature was introduced into the programme of the Annual Meeting of the Institution of Gas Engineers on June 12-13. A series of questions had been submitted by members of the Institution, and the Council had selected those which were considered to be topical and which could usefully be discussed. An expert had been briefed to deal with each question, and opportunity was given for the general discussion of each at the meeting. The following is our report of "Question Time."

Institution Publications

QUESTION: *The latest Institution Transaction Volume is dated* 1940–41. *Is it not possible to provide more up-to-date information on the activities of the Institution? The Institute of Fuel—now a growing organization—provides its members monthly with a Journal which maintains and stimulates interest in that Institute.*

Dr. **W. T. K. Braunholtz** (Secretary of the Institution) said: The last published volume of *Transactions* covers the year June, 1940–June, 1941. I fully share the disappointment of members that, under wartime conditions, it has been found impossible to keep these volumes up to date, although, of course, members have had all the Blue Books and Reports which would have been the principal contents of them. At the outbreak of war we were, in fact, up to date with our *Transactions*, and we are working to make up this leeway just as quickly as conditions permit.

Suggestions for developing the publications of the Institution had been under consideration before the war, but could not be followed up under wartime shortages of paper and labour. As the end of the war in Europe drew near these suggestions were revived, and a detailed memorandum on the subject is, at this moment, under consideration by the Council.

Briefly, the suggestion is to publish the *Transactions* in periodical parts, perhaps quarterly at first, and to enlarge their scope so as to include such sections as Institution Notes, Committee Memoranda, and a Students' Section. Contributed Papers and Reports would also be included in these quarterly parts, and would thus be more evenly spread throughout the year than under the present system. It is hoped, moreover, to encourage more members to contribute Papers, even if they are not for discussion at a general meeting. Papers and Reports for discussion at the annual general meeting and the autumn research meeting would be made available separately to members in the form of advance proofs, and the discussion would be published in the next following part of the *Transactions*.

In the Section that I have called "Institution Notes" might be included such items as reports of meetings of Council and Committees, notices of forthcoming meetings of the Institution and kindred bodies, examinations, special lectures, and possibly meetings of the District Gas Associations, elections to membership and transference, examination results, library notes, personal notes, including appointments, retirements, honours, obituaries.

Committee Memoranda might deal with matters under consideration by the Technical Committees, and memoranda on subjects of special interest such as have hitherto been circulated from time to time as special duplicated or printed documents.

The Students' Section might give information regarding courses, lectures, text-books, &c., and might even include short articles of special interest to students. Summaries of successful Diploma theses might be included.

The periodical issues would be bound in paper, and would be sent to every member entitled to receive the *Transactions*. Standard binding cases would be supplied free to members wishing to bind the parts for each year.

It is estimated that these periodical issues could be produced at a cost little if any greater than that of the present *Transactions*. On the other hand, the quarterly circulation to all members would involve an additional expenditure of between £100–£150 per annum.

There are, of course, many points of detail which I have not mentioned, but which have to be considered carefully by the Council—*e.g.*, Should the page size of the *Transactions* remain as at present? How should contributed Papers be approved for publication? When should these suggestions (if approved) come into operation? On the last point, I need not remind you of the present difficulties in the printing trade—they are unfortunately only too obvious from the lateness of our publications for this meeting. It may, therefore, be impossible to put these new ideas into operation until printing conditions have become more normal.

All these matters are, as I have said, under review by the Council at the present moment. Any suggestions or comments from members would, I am sure, be much appreciated and carefully considered.

Mr. **G. L. Braidwood** (Gas Light and Coke Company): This question recalls a suggestion which I have had in my mind for some time concerning reference to information. If one wants to apply one's mind to any particular subject, the only means of obtaining information at present is to wade through the various *Transactions* of the Institution. I should like to suggest that the information that is available should be gathered together in some form of index, whereby we may be able to find the references to all the information available on any particular subject.

Mr. **Walter T. Dunn**: Some years ago we published an index of subjects and authors, and we found it extremely useful. Subsequently that was not done. I agree that it would be very useful to publish such an index now and in the future.

Research as a Revenue Producer

QUESTION: *The Institution has been carrying out research for a very long time. Could you inform me of any item of research which has contributed to the revenue side of the balance-sheet of gas undertakings?*

Dr. **E. V. Evans** (South Metropolitan Gas Company): I really cannot bring myself to take this question seriously; I feel that one of our members is setting a trap for me. I feel also that the member who posed this question is probably just as capable of answering it as I am, and that he is perhaps sitting in this room at the present time with his tongue in his cheek. The question, as a matter of fact, is framed to convey suspicion. It refers to the revenue side of the balance-sheet. I am not an accountant, but I do not know of there being any revenue side of a balance-sheet, which is generally a statement of the liabilities and assets of an undertaking!

But, Mr. Questioner, what really do you want me to say to you? Do you want me to take the profit and loss account of a typical gas undertaking, and to show that perhaps water gas would have been made at 6½d. per therm instead of 5d. per therm had not the Institution carried out work on the nature of the water gas reaction and the effect of the plant in achieving a high efficiency? Or would you like me to prove that the revenue from gas sold for space heating would have been so much less had the Institution failed to investigate the means of measuring the heat of combustion of gases, or the radiation from flames, or the radiation from bodies immersed in flame?

In the same way that I cannot tell you the precise loss of revenue that results from a horizontal retort house filled with stopped pipes, I cannot tell you that here one saves £10,000 and there one saves £2,500 or some other figure. The main function of research is to bring about an understanding of what we are doing, and it is this understanding that enables us to modify our income and expenditure account. Thus, knowledge of the behaviour of flame, for instance, of the nature of electro-magnetic radiation from flames—or perhaps I had better use the term "radiant energy" instead—enables our inventors to design gas fires or to design infra-red drying ovens. Will the questioner agree that these matters do play a large part in increasing the heating load and the revenue derived from it?

Here may I take one outstanding example? I remember very well the days when, owing to the absence of knowledge of what takes place in the coal charge as it undergoes carbonization, we half-filled our horizontal retorts, leaving what I may call a revenue-destroying free space above the charge. When we realized, after studying the carbonizing process and the behaviour of the hydrocarbons as they pass through the coal charge, that it was absolutely essential to get rid of that free space and to fill the retort so that decomposition took place within the charge itself, the quality of the gas was higher and the yield was greater. Ammonia was conserved and was not converted to hydrocyanic acid, most of the sulphur was recovered as hydrogen sulphide, and there was less carbon bisulphide and thiophene, the tar was fluid and was not full of free carbon, the ascension pipes were not blocked with carbonized pitch, the naphthalene was less.

Dr. **S. Pexton** (Gas Light and Coke Company): I can recall one instance of the research activities of the Institution—namely, Dr. Dent's work on the improved combustion of blow gas in carburetted water gas plant—which I venture to say has contributed a very great deal by the improved gas yield from the gas oil.

Mr. **A. G. Grant** (Whessoe Foundry and Engineering Company): I feel that somebody should disagree with the viewpoint expressed by Dr. Evans. I feel that this question, necessarily expressed very briefly, is a valuable and healthy one. Probably most people here have the greatest confidence that the research that has been done in and for the Gas Industry has had a sound and true financial value. Nevertheless, research is necessarily a very long way away from what we do in our day-to-day activities and from what our Gas Committees and Boards of Directors see and our balance-sheets show, and I think it is healthy, no only for the Industry but for those who are engaged in research

and those engaged in the direction of research on the Gas Research Board, to think occasionally, "What have we done?" It seems to me that a most interesting and illuminating survey could be made at this stage of the contribution of research to the Industry through the Joint Research Committee and the Gas Research Board. We can go right back to the beginning, when I believe Dr. Smith lay at full length observing results in a very hot little chamber at Leeds which contained a gas fire and some radiation measuring equipment, and we could go through the whole series of researches, some of which at the time had a practical application, whereas the application of others was rather obscure. We did a great deal of work on the expansion of coke in steam, and I wondered then and have wondered since where it took us. It added to the sum total of our knowledge on the expansion of coke, but it would be quite interesting to know which parts of those investigations were really fruitful and which produced negative results.

So I suggest that if at some time during the next few years it is possible to make an assessment, not in the form of money, of the work that has been done and the way the results have impinged on the working of our industry, it would be more than valuable.

Dr. **A. Parker** (Director of Fuel Research): I also think that it is good occasionally to take stock. I recall the work extending to the first co-operative large-scale research undertaken by this Institution for the Gas Industry. The first piece of work on the steaming of the charges in continuous vertical retorts is an obvious case in which research has increased revenue, because the thermal yield of gas was at once increased, and the yield of many other products was increased at the same time. The yield of ammonia was increased, and at that time ammonia was worth more than it is now. The price of ammonium sulphate was then about £19 per ton; I do not suppose we shall ever see that condition again. With that increase in the yield of ammonia there was very little loss in the quantity of coke. That is one specific case in which revenue has definitely been increased, and I think that such cases could be multiplied many times.

Mr. **L. T. Minchin** (Gas Light and Coke Company): We all know that in the many investigations which have been made by the Joint Research Committee, and subsequently by the Gas Research Board, the question of gas quality and combustion characteristics has played a large part. It seems fairly clear that, in the present state of knowledge, the gas manufacturer can now definitely arrange his gas supply so that the quality will not vary beyond certain limits and will not cause exceptional difficulties on the district. That seems to be a decided and concrete gain which is due entirely to the research work carried out by the Industry in Leeds, in London, and at Bournemouth. Not only can it be established by a simple test that the gas will be of such character that it will not cause difficulty in the appliances, but it is also possible to make more variation in methods of gas manufacture than could have been risked before. So that if and when the results are applied in practice, mintenance costs will be reduced, appliances simplified, and their performance improved, while at the same time the flexibility of gas manufacture will be greater.

We might at the same time think of another subject which, because so little research has been directed to it, may have been the source of considerable loss of revenue to the Gas Industry. I refer to gas lighting, which now seems to be declining almost beyond redemption, and on which no fundamental research work to speak of has been done in this country during the past 30 years. We might think of that as an example of lack of research work which will probably result in a definite loss to the Industry. An enormous amount of money has been spent on electric lighting, but practically none on gas lighting. We cannot tell what the results of research on gas lighting would have been; but it is possible that if more work had been done on it, there would not have been the decline that we are now witnessing.

Dr. **Harold Hartley** (Radiation Ltd.): I should like to recall one piece of research work, already mentioned by Mr. Grant, which was carried out by Dr. E. W. Smith, and was finished about the year 1911, on methods of determining the radiant efficiency of a gas fire. I have always felt that members of this Institution have never realized how important that work was. I speak as one concerned in the making of appliances. That work drew attention to the means of assessing the merit of appliances. Prior to that date, I imagine, appliances were sold largely on appearance. In the decade following that work, which included four years of war, I suppose the effective efficiency of heating of fires increased by at least 33%. That had a big effect on the saleability of gas, because gas is of little use to the consumer unless there is a satisfactory appliance in which to burn it. But another point is that the appliance makers of this country then realized that they must bestir themselves and carry out investigation work themselves. I know of nothing which has been done for this Industry by way of research, and *ad hoc* research if you like, which has been so valuable to us.

Mr. **F. C. Briggs** (Dudley): I find it very surprising that the scientists rush in to justify themselves on the basis of £. s. d. I should have thought it would have been the other way round. It should be said that if the whole of the research carried out by the Institution produces nothing, so far as one can see, that will bring in revenue, yet if it is increasing our fundamental knowledge of our own business which for so many years had been lacking, it is fully justified and must inevitably result in better service to the public. It is that which we exist to give.

Materials for Service Pipes

QUESTION: *In view of the comparatively short life of wrought iron gas service pipes in certain soils in the past, the probability that wrought iron pipes will not be available at all in the future, and the still higher corrosion factor in steel tubes, is it not advisable that metallurgical research work should be carried out to produce an economic tube by alloying steel with other non-corrodible metals?*

Mr. **H. J. Escreet** (Gas Light and Coke Company): The production of a tube suitable for service pipes with high corrosion resistance and at an economic price forms part of the much larger problem of producing corrosion-resisting steel for steel structures, and as such has been the subject of research both by individual firms and by such bodies as the Iron and Steel Industrial Research Council, the Iron and Steel Institute, the Institution of Civil Engineers, and the National Bureau of Standards of the U.S.A. for many years.

A Sub-Committee on the corrosion of buried metals was set up jointly by the Iron and Steel Institute and the Institution of Civil Engineers some years ago, but no report of their conclusions has yet been issued.

The work of testing corrosion resistance is necessarily a lengthy process, as the materials to be tested have to be buried in various types of soil and examined at intervals of several years.

In a recent Research Paper issued by the Bureau of Standards, reporting the results of tests on the corrosion of ferrous and non-ferrous materials buried in 14 corrosive soils for periods of up to nine years, it is stated that "although the addition of small percentages of certain alloying elements improves somewhat the resistance of ferrous alloys to some soil conditions, the improvement cannot be considered significant. Ferrous materials must contain very considerable quantities of nickel, chromium, or other elements if they are to withstand the action of severely corrosive soils." It does not appear, therefore, that the prospects of producing a corrosion-resisting steel at a reasonable price are very great.

However, the subject of corrosion of both steel tubes and cast iron pipes has recently been considered by a Committee of the British Standards Institution, and it was agreed that the problem should be referred to the Iron and Steel Institute and the Cast Iron Research Association for investigation and report. I think it is evident that research on this problem is already being actively pursued in many quarters, although much of the work has no doubt been interrupted during the war, and there does not apear to be any case for special research by the Gas Research Board. Pending the discovery of some more suitable material for service pipes, I think the solution to our problem lies in the protection of these pipes either by surrounding the pipes with pitch or cement mortar, using a wooden trough as a mould, or by wrapping with bituminous or other protective material as recommended in the Code of Practice for Gas Service Pipes recently drawn up by the Codes of Practice Sub-Committee of this Institution.

I would refer the questioner to the Report on Protective Coatings for Underground Pipes, by Densham and Smith, which was presented at the Autumn Research Meeting of the Institution in November, 1935, for a detailed study of protective coatings. It is also of interest to note the conclusion in Part V of that Report, that there is no appreciable difference between the relative corrodibilities of wrought iron and steel. If that be true, as I believe it is, the present shortage of wrought iron tubing should not cause any serious difficulties.

Availability of Gasmaking Coals

QUESTION: *Is the anticipated expansion of the Gas Industry likely to be limited by a lack of coals suitable for carbonization?*

Dr. **J. G. King** (Director, Gas Research Board): The question was to some extent anticipated at a conference arranged by the Institute of Fuel in Manchester at the end of February. The chief matter for discussion then was coal quality, but there naturally arose the question of whether there would be sufficient coal of the quality postulated to meet the future requirements of the Gas Industry.

Speaking for the Industry at that conference, Messrs. Appleby, Thomas, and Tomlinson rightly placed emphasis upon the need for clean coal of fairly low ash content and for regularity of quality and size. The Industry has always wanted clean coal in order that it may produce for the solid fuel market a coke of reasonably low ash content. Its requirements in the important characteristic of caking power, however, have undergone, and are undergoing, a considerable change.

The type of coal which is most popular for gas-making to-day is the high volatile coal of fairly high caking power, which combines the properties of high gas yield with the power to produce a strong non-friable coke. Coal of this type can be used in any form of modern gas retort, with the sole reservation that for the continuous vertical retort it is preferable that it should be sized or should contain a fair proportion of sized coal. It is, nevertheless, common knowledge in many districts that quite satisfactory yields and outputs can be obtained from coals of much lower caking power, even if they have also a high content of volatile matter. Such coals are in everyday use in those areas where it is geographically convenient to use them to save transport charges, and the fact that they are less popular in areas where more highly caking coals are available is due to two reasons only, other than that of mere habit:

(*a*) The rather higher yields of gas obtainable from more strongly caking coals.

(*b*) Considerations of cost of transport (*e.g.*, Durham and Yorkshire coals are used in London and on the South Coast).

The importance of considerations of cost of transport is too well recognized to require emphasis here. It requires a marked difference in coal quality to over-ride the advantage, from the point of view of cost, of the use of local coal. Not only does this consideration affect the Gas Industry directly in its choice of coal, but repercussions are felt of the operation of the same factor in other industries. A substantial proportion of the gas-making coals of this country are undoubtedly used by other industries, not because their properties make them more desirable, but because they are to be found locally, and transport charges are therefore reduced. If in the future transport becomes considerably cheaper, these coals may be released for gas-making.

Two factors, however, are of importance:

(i) The sacrifices in gas yield, &c., which are entailed in using coals of lower caking power.

(ii) The national reserves of coals within the classes of gas-making coal, and the distribution of these reserves in relation to the centres of use.

With regard to the first, it must be admitted that there may be sacrifices. The caking power of good Yorkshire gas coal may be taken as G.8 in the Gray-King assay scale, or 8 in the B.S. Swelling-index scale. If the coal were of type E (B.S. Swelling-index 3), which is the lowest practical limit for gas-making at present, we have the following comparisons:

	Horizontal Retorts.		Continuous Vertical Retorts.	
Coal, caking power	G8	E	G8	E
Gas, therms/ton	70.5	65.3	91.4	83.3
,, calorific value	578	543	474	434
,, therms/day	—	—	228	208
Coke, cwt./ton	14.7	12.2	13.5	10.9
,, breeze %	—	—	9.0	17.0

These figures are for straight coals, and represent the extremes. What we have to consider is how much coal within this range is available annually for use in the Gas Industry in the event of increased production being required. Before suggesting an answer I would point out that:

(*a*) A great deal of information has been collected on the use, mainly in continuous vertical retorts, of coals nearer the lower limit of caking power; and

(*b*) A much higher proportion of the 20 million tons now carbonized annually by the Gas Industry is weakly-caking coal than is commonly supposed.

It has in fact been estimated that, while the Gas Industry uses to-day 10% of the nation's coal output, 30% of the total coal output of this country is good gas-making coal, and 50% could be processed in suitable plant of known make.

During the war years the Ministry of Fuel and Power has been evaluating, with the assistance of the Fuel Research Coal Survey Officers of the Department of Scientific and Industrial Research, the coal reserves throughout the country. Their first report, which deals with the Durham coalfield, has been published, and it is pointed out in it that the supply of coking coals in that area is being exhausted more rapidly than that of any other type. The Gas Industry will be particularly interested in this report and in those which will follow it, in order to determine whether their present range of coals will be exhausted more or less rapidly than the main reserves of other coals. I have arranged with Dr. Parker for Mr. Maries, who is closely concerned with this work, to speak to you now on potential coal reserves within the range I have defined—*i.e.*, of caking power G8 to E. I think you will find that the Industry has no cause for anxiety regarding the supplies of suitable coal for its post-war programme.

Mr. **A. C. Maries**: The Fuel Research Coal Survey Officers have been engaged for some time past on surveys of kinds of coal and qualities of coal, of the future output planned by the colliery companies, and of the reserves that will sustain that output. I propose to leave the question of reserves, and to consider the planned outputs put forward by the collieries for the next 10 years or so. It has been possible to take each of the little parcels of coal, the amounts of coal to be raised annually from each separate seam of the collieries, and to attach to the figures relating to quantity, data regarding quality as judged by the ash and sulphur content and the type of coal as judged by the volatile matter and caking properties. All the data necessary for this is now in my hands, but it will take some time to analyse completely.

As a first step I have made the first simple analysis of the future outputs for the next 10 years of the kinds of coal only, ignoring quality for the moment. Even with this limitation I think the figures will be of interest in relation to the question before the meeting. The term "gas coal" has different meanings in different coalfields. The criteria I have adopted in defining "gas coals" are that they shall be bituminous coals of more than 30% volatile matter (the great bulk of them actually have more than 35% volatile matter on the dry ash-free coal), and that the caking properties shall be medium, strong, or very strong. I have excluded metallurgical coking coals because, although some of them do come to the gas-works, on the other hand some gas coals go to coke ovens; if the quantities in those two categories do not balance out, the difference will certainly be lost in the rounding off of figures as I quote them.

The total annual planned output for the country for the years 1942–52 is 236 million tons. The actual total for 1938 was 227 million tons; so that you will see there has not been much wishful thinking on the part of the coalowners. The fact that these figures have not been attained recently in most coalfields is unimportant, I think; the planned output of 236 million tons per annum can easily be achieved.

The Gas Industry at present uses about 20 million tons (or 9%). The gas coals as I have defined them—the medium caking and strongly caking coals—amount to over 30% of the 236 million tons. Reduction will have to be made for coals of unsuitable quality, and for the fact that certain sizes and certain kinds of coal may not be suitable for certain types of retort. But the present usage is 9%, as against the 30% of coals possibly suitable. That leaves plenty of room.

There is, however, a further category which can be included. I refer to coals of somewhat less than medium caking qualities, and they represent about 15% of the planned output. Most of them are certainly suitable for gas-works when carbonized alone; and if blending is considered we must also take into account the non-caking coals, representing about 20%.

Dr. **A. Parker** (Director of Fuel Research): Over a period of possibly 20 years the Fuel Research Coal Survey has grown from small beginnings until it has now about nine Coal Survey Laboratories covering all the principal coalfiefds of this country. In the first place the problem was to get information on quality by taking pillar sections and examining them carefully for shale bands and quality in the different parts of the seams; and it was possible to construct maps of the coalfields to show changing quality with seams and districts.

The next problem was to make a survey of quantity, which was not so easy. Geologists have made estimates of quantities or resources of coal in Great Britain in the past, and have gone down to seams at 4,000 ft. and to a thickness of only 1 ft. According to those estimates, we have enough coal for several centuries. But it is not all economically workable. Allowing for various factors, I think we can take it that the coal of the country as a whole, the economically workable coal, will be sufficient for, say, two or three centuries, to meet the requirements of everybody, but without dividing the qualities.

I think we may say that the amount of coal suitable for gas-making which could reasonably be worked in the next 10 years is two or three times the amount at present used by the Gas Industry. So that I think we may say that, subject, of course, to labour conditions and organization and a number of other economic and political factors which we cannot discuss here, the Gas Industry could be doubled without any serious difficulty. It would mean organization, and there would be transport problems. Some seams will be worked out, while others will give greater production.

Although I have given this rather hopeful picture, I would at the same time stress that I think research should continue on the possibilities of blending different types of coal and carbonizing them under other conditions, because as I see it the Gas Industry will become more than a Gas Industry; it will be an industry producing solid smokeless fuels in greater quantities. It is quite definite that you can use solid smokeless fuel in domestic appliances with greater efficiency than coal. So that we want development on that side and considerable development in the design of domestic appliances.

Central Testing Laboratory

QUESTION: *Would not the formation and operation of an Industry-sponsored testing laboratory, to report on all appliances using gas, offer enormous advantages to the gas undertakings in this country, from the points of view of ease of installation, ease of maintenance, efficiency of operation, and national prestige?*

Mr. **J. E. Davis** (South Metropolitan Gas Company): In this question there are combined several ideas, to some of which I would answer "yes" and to others "no."

I believe that gas undertakings in this country would derive very great advantages from more precise knowledge of the performance of various gas and coke appliances, of their most appropriate use either alone or in combination with one another, and from the collation of experience in meeting consumers' needs. Some of the work necessary to provide this information is laboratory work, but not all of it, and the laboratory work is inadequate in itself unless closely related to practical experience. A central national laboratory of the kind suggested would be in great danger of becoming remote from practical experience.

In this matter, as in so many others, we have to find a middle way between rigid uniformity, which means sterility, and excessive diversity, which means chaos. A single national laboratory would run the risk of sterility.

By leaving the laboratory work entirely in the hands of appliance manufacturers, the supply side of the Industry would lose the great value of laboratories as training grounds and reservoirs of expert advice, as well as foregoing an opportunity to examine new solutions to practical problems in the early stages when none but the inventor believes in them.

I would suggest that the Gas Industry in Great Britain needs about half-a-dozen laboratories serving the utilization side in appropriate geographical districts, together with a central national link. This national link should not be a laboratory, but just a meeting-place and

a secretary. Individuality and differing points of view would then be possible; indeed, they are certain to arise from half-a-dozen different centres, while reconciliation between them—in so far as reconciliation is necessary—can be effected through the central contact.

Past experience suggests that a development laboratory requires the support of about one million consumers if it is to operate on an adequate scale without proving too costly. Thus, there are in Great Britain enough gas consumers to justify the half-a-dozen centres suggested.

May I, in conclusion, emphasize that laboratories for testing and experiment are essential components of a progressive modern industry, but they are only components and cannot function successfully in isolation. To develop their full usefulness they must work in the closest co-operation with all departments of the industrial organization.

Mr. **A. Forshaw** (R. & A. Main, Ltd.): The way in which the question is posed rather implies a disaffection on the part of the gas appliance manufacturers. I do not know whether the questioner had that in mind. However, I will ask a counter question: Has the gas appliance industry let the Gas Industry down in the matter of appliances? I think the answer to that is plain; I do not think we have let them down.

Generally speaking, when this question of a testing laboratory is raised, the example of the American Gas Association is put forward. When the formation of the American Gas Association's testing laboratories had to be considered, the appliances which we imported for our own information from America indicated that such a step was very greatly necessary. In regard to efficiency, consistency of results and everything else we had to consider, those appliances really did need something doing to them, and they were I think a long way behind our standard in this country.

The question before us also raises the matter as to what standard an appliance laboratory would have to adopt. Would it have to adopt a low standard in order to allow certain existing appliances to come in, or would it have to adopt a higher standard, which would mean cutting out a number of appliances which may be at present in use?

I should like to mention the CO/CO_2 ratio, or in other words the criterion of hygienic efficiency. I am suggesting what may happen if we have a laboratory doing nothing else but standardizing appliances. A Committee of the British Standards Institution was formed, and this matter of the CO/CO_2 ratio was considered. In the generally accepted standard at the moment for appliances that ratio should not exceed 0.02. But in the Committee the attempt was made, by those who were interested more in testing appliances and not in manufacturing them, to set a very much more severe standard—namely 0.01. Eventually the attempt was scotched. A standardizing laboratory will always try to screw up the standards, and in some instances I think those standards become screwed up to a point which is unnecessarily severe.

I should like to add my tribute to the value of the work of Watson House to the gas appliance manufacturers; my own firm has always worked with them. But I think that if Watson House became a national concern, a number of the advantages derived from it would be lost.

Mr. **G. C. Holliday** (Gas Light and Coke Company): I would like to point out that one-third of the industry at the moment receive confidential reports, through the Gas Light and Coke Company's Domestic Centre, on all appliances tested at Watson House. Before the war about 700 appliances passed through the laboratories. The testing includes not only mechanical efficiency, performance, and safety tests, and so on, but it also includes considerations of ease of installation, maintenance, and renovation. The manufacturer is often asked to make modifications to meet the requirements. Meetings are held with district personnel to discuss defects and difficulties experienced with appliances actually in use, and frequent surveys are made of district conditions. The information obtained is of the utmost value to the laboratories in their work, and it is one of the most important factors, if not *the* most important factor, in testing. I agree with Mr. Davis that there is a very real danger of isolating testing from actual consumer experience. If there is to be more than one testing laboratory—which may be desirable on account of the different conditions geographically—there should be very close liaison between the laboratories in order to avoid too much overlapping. The testing of coke appliances I consider to be equally important. Finally, I shall continue to try to screw up standards, provided they are attainable in practice and will result in giving better service to the consumer.

Why not Mechanical Producers?

QUESTION: *Why does the Gas Industry not use mechanical producers in place of manually cleaned step-grate producers to a greater extent?*

Mr. **T. Campbell Finlayson** (Woodall-Duckham Companies): Presumably the questioner refers to the *British* Gas Industry, because mechanical producers have been used on a large scale on the Continent. Three local factors must be borne in mind when considering the popularity of mechanical producers on the Continent; the practice of waste heat recovery in the form of steam has not been so widely developed as in this country; the coke to be gasified frequently has a relatively high ash content; and labour, rather than thermal, considerations may be the outweighing influence.

In this country the plant designer has set out to provide an installation which will manufacture gas at the lowest cost per therm. Three important factors in achieving this are: (1) Fuel cost; (2) capital cost; (3) labour cost.

The attainment of low fuel cost and low capital cost have, in a large number of installations, been realized by the provision of compact non-recuperative settings, heated by hot producer gas made in step-grate producers, the waste heat from the settings being recovered in the form of steam.

My friend Dr. Pexton, in 1943, dealt with the whole question of the fuel requirements of carbonizing plant in a most admirable way, and reference should be made to his Paper for facts on the subject-matter of this question. Among other matters he showed that the step-grate producer from which the gas is used hot may be credited with an efficiency of 87%, whereas a mechanical producer from which the gas is used cold may be credited with an efficiency of 76%.

Cold producer gas involves the provision of either recuperators or regenerators for pre-heating the producer gas, which in turn involves increase in capital cost of the setting. But the provision of mechanical producers does not necessarily involve the supply of clean cold gas, as such producers can supply gas sufficiently hot for direct use in a non-recuperative setting.

Why then have mechanical producers not been adopted in place of step-grate producers with modern non-recuperative settings? The reasons seem to be as follows:

(1) *Fuel Cost.*—It is difficult to forecast any saving in fuel, because the sensible heat of the producer gas as it leaves the producer would be lower by at least 200°C.

(2) *Capital Cost.*—The capital cost of the mechanical producer installation is considerably higher on two grounds—firstly the actual cost per producer, and secondly the need for a greater extent of stand-by equipment. For example, a 4-million cu.ft. per day installation might require six step-grate producers, one of which would be a stand-by. But to provide for continuous operation the mechanical producer installation might involve three producers, two working and one stand-by.

(3) *Labour Cost.*—Taking into account the extra maintenance cost of mechanical in comparison with step-grate producers, it is difficult to forecast any reduction in overall labour cost—although, of course, the nature of the fire-cleaning operations is changed for the better.

(4) *Maintenance Cost of Carbonizing Plant.*—It is generally found that the causes which lead to the need for retort repairs (at any rate with continuous and intermittent retorts) operate from within the retorts rather than from the combustion chambers, and therefore the provision of producer gas with less dust would not necessarily reduce the cost of maintenance.

(5) *Grade of Fuel used for Gasification.*—The general experience is that mechanical producers, with their high gasification rates, are even more sensitive than step-grate producers as regards the quality of fuel they gasify. Breeze can be gasified in either form of producer to a certain extent by suitable design and adjustment of gasification rate. but with mechanical producers lower gasification rates increase the capital charges still further.

A brief answer to the question is, therefore, as follows: There is no practical difficulty in adopting mechanical producers in place of step-grate producers. There are good mechanical producers to meet the need. But step-grate producers have the advantages of higher thermal efficiency and lower capital and maintenance charges. Therefore, it is hard to see at the present time how their incorporation would lead to the production of gas as cheaply as by present methods.

Amenities for Workers

QUESTION: *How far should the Industry improve the amenities under which their workpeople have to perform their duties, if the provision of such amenities raises the cost of gas production?*

Mr. **T. F. E. Rhead** (Birmingham): I welcome this opportunity of opening a discussion on a matter of very great importance to the Gas Industry in particular and to industry in general.

I am assuming that by "amenities" is meant the following group of items: Canteens, changing, locker, washing, and lavatory accommodation; satisfactory conditions of lighting, heating, ventilation; safety; ambulance and rest rooms; medical matters; recreational and educational facilities, &c. These are generally included in Welfare. I would add two other important items: the treatment of design of plant and of technique of processes to make them as free as possible from danger to health or limb and from being over-fatiguing and needlessly awkward. The scientific and technical staffs can help greatly in these directions.

A certain average level of achievement in many of these items is required by the Factory Act, which in this democratic country reflects the average degree of enlightenment of the community. Fortunately, however, a growing number of concerns go considerably beyond this legal minima, and I take it that this is the aspect the questioner wishes discussed—"to what extent is it justifiable to elaborate or add to the legal minima of amenities if it adds to the cost of the product?"

Members of management in industry (and by "management" I mean any executive officer who has it in his power to control or influence the

livelihood of a group of workers) have usually had the advantages of better education and experience—maybe self-striven for—than the rank and file. While this gives them the better emoluments attached to management, it places on them the moral obligation of seeing that their employees are working under conditions conducive to self-respect and the dignity due to humans living in a community which professes Christian standards.

Employees come from many walks of life and possess varying degrees of strength of character. Some characters increase in stature, in spite of adverse environment. The majority, however, are greatly influenced by environment; if it is bad they deteriorate, whereas if it is good they frequently become better citizens.

Where manufacturing processes are still arduous and dirty and subject to extremes of heat and cold, it behoves the management to pay special care to amenities. Enlightened managers, possessing as they do humane views and broad sympathies, do a lot more in providing amenities to encourage self-respect and self-reliance in their employees than less gifted managers, and this without endangering the balance-sheet.

Management has a three-fold task in this matter:

(1) To convince the shareholders (*via* their boards) or ratepayers (*via* their committees) of the rightness of providing the degree of amenity they are advocating.

(2) To provide such amenities.

(3) To get the willing co-operation of their employees to use such amenities for the mutual benefit of themselves, and the more efficient production of the product they are making for some part of the community. No business is justified unless it is making a product which truly benefits the community; that should be the real *raison d'être* of business.

No. 1 is very difficult if profits are low or non-existent, and can only be met by persuasive and informative arguments which appeal to the idealism found to some degree in most people, or, failing this, by comparison with the amenities of other concerns.

No. 2 does not call for comment.

No 3 is largely a matter for the welfare officer working through works committees, the latter having the best chance of creating an *esprit de corps* among the rank and file to use the amenities and keep them in good order, or in vigorous and progressive condition.

Perhaps a word of warning is necessary. The motive behind the provision of amenities has, I believe, an important psychological bearing on the degree of confidence reposed in a management by the more enlightened of the employees. Appreciation is not enhanced if the provision of amenities is used as an advertising stunt. Appreciation is likely to be greatly restricted if the motive is just to make the employees more efficient robots. If, however, the motive is to give the employees some worth-while meaning to life while they are at work—which is a big proportion of their wakeful hours—this I am sure will beget respect, confidence, and happiness. This state of mind will be reflected in willing and loyal service—always assuming that hours of work and rates of pay are reasonable, which in turn must improve efficiency and be conducive to producing the product as economically as practicable.

In conclusion, I have purposely appealed to the vein of idealism which runs in most of us, as I am sure it far and away transcends all other argument. For the realists among us, however, we must not lose sight of the fact that, during the war in particular, workers have been experiencing better amenities, and we should be foolish to lag behind if we want to attract new entrants.

As to whether any particular amenity will put the price of gas up depends on so many human intangibles that it is hard to say. But this should not stand in the way of doing the right thing. An action which gains the respect, confidence, and approbation of the workers tends to result in better team spirit and more efficient and economical work, which may outweigh the cost of the amenity.

Finally, I would strongly advocate the setting up of a Committee to formulate "Good Practice" in the Gas Industry as regards amenities.

Mobile Training Kitchen for the R.A.F.

An interesting feature of the R.A.F. Educational and Vocational Training Scheme is a mobile kitchen and homecraft class-room which is now touring R.A.F. Commands.

With the co-operation of the Gas Industry, a practical and attractive kitchen unit was assembled in wood and lined with asbestos by a carpenter of the R.A.F. Intended for the training of the W.A.A.F. for their return to civil life, the scheme is to enable domestic science instruction to be given at R.A.F. stations throughout the country where teaching facilities would not otherwise be available.

The van is fitted with the most modern equipment, including a gas refrigerator, water heater, and cooker. There is a combined draining-board and sink in primrose yellow, complete with fittings. All gas-burning appliances have been specially adapted for the use of Calor Gas, which is supplied from three cylinders, whilst water is circulated to all taps from a 30-gallon tank fed by a hand pump from a main 50-gallon tank.

The scheme is to operate during the interim period between the end of the war in Europe and the defeat of Japan, and should prove of inestimable value to the many women in the W.A.A.F. who are eager to fit themselves for return to a normal home life.

An Unusual Housing Exhibition

The young men and women now in the Services and shortly to be demobilized are the acknowledged No. 1 target for domestic gas propaganda.

With one of the largest Barracks assemblies in the country forming part of his district, Mr. H. J. Randall, Managing Director of the Yorktown and District Gas and Electricity Company, decided that all these young people should see the advantages of gas without the trouble of coming to his showrooms; he would strike a new line in propaganda and take his showroom right to the camp itself.

To this end a large Nissen hut, placed at his disposal by the Commandant of the R.E.M.E., was, with the assistance of a willing staff directed by Mr. J. Hyde, transposed into a first-rate Town Planning and Housing Exhibition. Included were two complete kitchen units, together with a selection of latest pattern cookers, water heaters, wash boilers, &c., and a working gas refrigeration unit.

Tremendous interest was aroused, especially among the large A.T.S. detachment, and over 1,000 Service visitors were entertained in the first two days. During the run of the Exhibition many more thousands of prospective home-builders saw for themselves the advanced types of equipment that the Industry will have waiting for them when they return to civil life.

The Leicester Branch Meter Works of Willey & Co., Ltd., will be closed for their employees' Summer Holiday from July 9 to 14 inclusive, instead of the usual August Bank Holiday week. A skeleton staff will be in attendance to deal with urgent enquiries.

The Annual Report of the gas undertaking presented at a meeting of the Coventry City Council, stated that the total gas made for the year was 17,534,625 therms, a decrease of 1,467,610 therms—equal to 7.72% on the previous year. The gas sold was 16,059,835 therms, a decrease of 1,538,710 therms—equal to 8.74%. The final result was a profit of £28,248, and after the deduction of certain items, left a balance of £12,449. This, with the balance of £19,094 brought forward from last year, made a total of £31,543 to be carried forward to the current year's accounts.

Technical Aspects of the Gas Industry's Contribution to Post-War Housing

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I. Introduction

MUCH time has been devoted at Watson House in the last eighteen months to problems associated with housing, and although some of the results of this work have been circulated by the Domestic Development Committee of the British Gas Council, the Authors welcome this opportunity of setting out in fuller detail what appear to them to be important technical aspects of fuel service in post-war homes.

All in the Gas Industry realize how greatly expansion in the domestic use of gas and coke may in the future be influenced by an agreed national fuel policy, by acceptance of the principle of freedom of choice, by tariffs, by relative prices of fuels in post-war years, and by technical improvements in the production of fuels and in appliances.[1]

The important contribution that gas and coke can make now and the standard of service they can give in post-war homes is not generally realized.

According to the Government White Paper on Housing,[2] 1¼ million new dwellings are urgently needed to provide a separate home for every family which desires to have one, to replace houses condemned since 1935 as unfit, and to abate overcrowding. For the first two years after the end of the European war the Government has fixed a tentative target of 220,000 completed permanent houses, with a further 80,000 in course of erection. In addition, the programme includes the provision of at least 145,000 temporary prefabricated houses. Various estimates suggest that within ten years probably something like four to five million new dwellings will be required.[3, 4, 10]

Since there will be serious initial shortages of labour and material, and urgent need for repair and maintenance of existing buildings neglected during the war and for other buildings such as schools, it will be seen that new housing is only part of the vast task facing the building industry. An excellent survey of the whole problem is given in *Rebuilding Britain*, by Sir Ernest Simon.[16] Some idea of the size of the problem of housing alone may be judged from the following figures: The capital cost of five million homes without sites is, at present prices, about £4,000 millions[15]; the total net annual coal required for fuel service may vary according to the extent to which raw coal, gas, coke, and electricity are used from 15 to 30 million tons, and the capital cost of fuel equipment will be of the order of £250 millions.[17]

The Government has performed a valuable public service in directing much closer attention to the necessity for providing "good" houses—*i.e.*, houses of sound construction, houses which will make possible an improved standard of living for the occupants, yet be reasonable in first cost, running and maintenance cost; and houses, too, which from the housewife's point of view are properly planned, labour-saving, and provided with equipment to satisfy aesthetic as well as utilitarian needs. The fact that two to three times the original cost of the whole house was being spent pre-war on fuel alone by the occupants in, say, 60 years shows how important it is to provide facilities for modern fuel equipment in the future.[18, 5]

As a fuel industry supplying before the war about 35%[14] of the useful heat for domestic purposes, the Gas Industry is vitally interested in rehousing and the contribution that gas and coke can make to the solution of the problem. Though the Gas Industry may be convinced that there is an indisputable case for considerable extension in the use of gas and coke because it can offer for any standard of domestic heat requirement a smokeless labour-saving service, at reasonable capital cost, low running cost, and least cost to the nation in terms of raw coal, it cannot be said that local authorities, architects, and the public generally are yet as fully informed as they should be on the merits or national importance of these fuels.

Success in the extension of gas and coke usages depends not only on the efforts of such central bodies as the Domestic Development Committee, but also very largely upon the individual gas undertaking's detailed formulation and presentation of plans for the equipment of houses on its own area of supply.

It is hoped that the information given in this Paper will be of some practical assistance at a time when important decisions on housing are being made all over the country.

II. New Standards for Housing

General.

In order to ensure that the fullest advantage shall be taken of technical knowledge, various study groups and committees were set up at the request of the Government to make recommendations on the many aspects of building and services—*e.g.*, house construction and design, heating, lighting, and ventilation, and installation of solid fuel, gas and electrical equipment.[21, 22, 23, 24, 25, 26, 27, 28]

The Ministries of Health and of Works have also published a Housing Manual[30] and technical data[31] to assist Local Authorities on the design and construction of dwellings, and demonstration houses have been erected at Northolt.[10] The Scottish Housing Advisory Committee set up by the Secretary of State for Scotland has also published[32] a report. Reports have also been prepared on Private Enterprise Housing[33] and Rural Housing.[34]

The Ministry of Works has issued a progress report on The Use of Standards in Building,[35] and the British Standards Institution has brought together in a handbook specifications for building materials and equipment.

In addition, many reports and surveys on housing have been prepared by various bodies and political parties.[37–49]

In this Paper attention is confined to those recommendations directly or indirectly affecting the fuel services. The most important of these may be summarized as follows:

(1) Planning of the house at the drawing-board stage with a view to the provision of all the necessary services by which the occupants can obtain a good standard of living—*e.g.*, adequate warmth, hot water, and other amenities.

(2) Hygienic considerations—*i.e.*, provision of adequate ventilation, artificial and natural lighting, &c.

(3) Economy in fuel, running and maintenance costs by—

(*a*) Good standard of insulation of structure.
(*b*) Insulation of hot-water systems.
(*c*) Efficient and good quality fuel appliances.

Great stress is laid on the necessity for low running cost. "A scheme low in capital cost may often be dear to run and maintain and may be wasteful of the nation's fuel resources" (*Housing Manual*, p. 31).

(4) "The Government attach particular importance to smoke abatement in view of the injury to health and to general amenities caused by atmospheric pollution. The extra labour for the housewife is another evil which must not be overlooked" (*Housing Manual*, p. 30).

(5) Much attention is directed to the correct choice of fuel service appropriate to the "way of living."

(6) The necessity for convenience, cleanliness and easing of the work of the housewife is implicit in many of the recommendations.

No one in the Gas Industry will quarrel with these recommendations; indeed, as a statement of the Industry's own aims it could hardly be bettered.

Codes of Functional Requirements.

The suggested new standards based on the various Building Study Reports are being summarized in generalized form in the Codes of Functional Requirements.[21] It should be noted that at present neither the Codes of Functional Requirements nor the more detailed Codes of Practice[29] are mandatory, but they should become increasingly recognized when the most practicable and economical methods of realizing the recommendations are known. It is on the initiative of the Ministry of Works that the Codes have been prepared, and the Government will no doubt take the lead in showing how houses conforming to the new standards can best be built.

The main recommendations of the Codes, which it should be noted are still in the draft stage and subject to revision, are as follows:

Heating and Heat Insulation.

"The air temperature in occupied rooms should be 60° to 65°F if heating is by convection, or 52° to 57°F. if heating is mainly by radiant heat. Also, a background temperature of 45° to 50°F. should be maintained throughout the whole house. Attention is directed to the

large saving in the annual fuel bill and marked increase in comfort obtained at a relatively small increase in capital cost by adequate insulation of the house. The value of low heat-capacity linings to the walls of rooms in intermittent occupation is also stressed."[24]

These standards are intended to ensure that the whole house is reasonably warm and to enable all the living space provided to be usefully employed.

The most important factor determining the amount of heating required is the difference between the outside air temperature and the required inside air temperature, since the inside air temperature of an unheated house is approximately 5°F. above the outside air temperature.[50]

Table I, based on data from the London area,[22] divides the year into six periods according to heating requirements:

TABLE I.—Outside and Inside Air Temperatures over Six Periods in the London Area.

Period.	Number of weeks.	Outside Air Temperature, °F.	Inside Air Temperature, Unheated, °F.	Inside Condition.
1	2	3	4	5
1	7	30 to 40	35 to 45	Bitterly cold
2	7	40 „ 45	45 „ 50	Cold
3	8	45 „ 50	50 „ 55	Cool
4	8	50 „ 55	55 „ 60	Mild
5	9	55 „ 60	60 „ 65	Warm
6	13	Above 60	Above 65	Hot

It is clear that background heating throughout the house will only be needed for 7 to 14 weeks according to the standard chosen. Heating of occupied rooms will be needed for 30 to 39 weeks. It should be noted that the days and weeks which make up the six heating periods are not necessarily consecutive because unseasonable cold or hot spells are commonly experienced.

In Appendix 2 the implications of these new heating requirements are considered in some detail.

Water Heating.

"The amount of hot water needed for a family of four is estimated as 220 to 350 gall. per week—equivalent to 160 to 250 gall. at 140°F. These weekly quantities can be allocated as follows, on a basis of 140°F.:

Bath	70 to 110 gall.
Basin	20 to 40 ,,
Sink, &c.	70 to 100 ,,

The normal temperatures at which water is needed for household purposes are:

Wash basin and bath	110 to 120°F.
Sink use	130 to 140°F.
Laundry use	212°F."[25]

Even the lower standard of usage of 220 gall. per week is a marked advance on pre-war standards, and recognizes that ample hot water is a vital factor in improving amenities and hygiene generally and lightening work in the house.

Cooking.

"Whenever possible gas and electricity supplies should be available for cooking."[26]

It is generally agreed that for the normal small house the cooker should be capable of providing the complete cooking requirements for a family of up to six in number. Cooking is an intermittent operation, but requires, to a marked degree, speed and certainty of results. Overheating of the kitchen in the summer and mild weather should be avoided.

Laundry.

"A distinction is made between a house with utility room and one in which the laundry appliances are in the kitchen.

Utility Room.—The following equipment should be provided:

Wash boiler or washing machine.
Drying cupboard.
Collapsible ironing board.
Airing cupboard.

Kitchen.—Although the requirements are similar it is recognized that there may not be space available for the drying cupboard.

Special attention is drawn to the need for adequate ventilation to avoid a steamy atmosphere in the kitchen."[28]

The normal size of wash boiler, 8 gall., is adequate, and provision should be made for a wringer.

Refrigerators.

Space should be allowed for a refrigerator in all houses and flats. The size suggested as suitable for the 3-bedroom house is approximately 3 cu.ft.[27]

Ventilation.

The following minimum standards of permanent ventilation are suggested, apart from the greater amount of ventilation which can be obtained if required by opening windows:

Room.	Standard.	Suggested Method.
Living rooms, Bedrooms	600 cu.ft./hour fresh air per occupant	Flue or ventilating shaft, 50 sq.in.
Kitchen	1,000 cu.ft./hour fresh air	„ „ 30 „
Bathroom	3 air changes per hour	Unspecified „ „ 30 „

The flues or ventilating shafts should terminate above the ridge, and in addition to these extract flues provision should be made for effective fresh-air inlets.

The ventilation of the kitchen is of special importance in order to avoid discomfort from steam and overheating and also to prevent percolation of steam and cooking odours into other rooms.[28]

The need to provide flues gives a clear example of the importance of considering the ventilating and heating requirements at the first possible stage in the planning of a house. It is only by such planning that flues can be built into a house at a minimum cost and without sacrifice of appearance.

Choice of Fuels.

The Functional Codes specify requirements irrespective of the fuels to be used. Reasonable freedom of choice is essential if full advantage is to be taken of possible developments in the utilization of all fuels. The Gas Industry's attitude is clearly stated in the British Gas Federation's Report on the Planning of the Gas Industry,[54] and the Utilization Sub-Committee[57] has given an indication of how the principle can be realized in practice.

It should be noted also that if provision for pipes and installation of appliances has to be made after the building is completed, the cost may be three or more times as great as that which would have been incurred at the time of building. If facilities on the lines suggested are provided initially, the small extra initial cost of some duplication of services may be far outweighed by the full advantage that can be taken by the occupants of the more efficient appliances still to be developed by any of the fuel industries. This enables them, where a little extra money is available or where tariffs are favourable, to obtain fuller automatic and labour-saving service by gas or electricity as desired.

The Code of Functional Requirements on Cooking Installations emphasizes the need for freedom of choice, and states, "It is preferable at the construction stage of the building to provide the necessary connection with both gas and electric supply if they be conveniently available, even though the initial or ultimate choice of appliance may favour a type using solid or liquid fuel."[26]

The Scottish Housing Advisory Committee's recommendation[23] that houses be piped for gas "only if gas is likely to be much more economical than electricity for cooking and heating purposes" is an example not only of lack of knowledge of the convenience and technical merits of gas, but also of its national importance as a conserver of coal. This attitude is opposed to the principle of freedom of choice, and assumes also that local authorities are in a position to forecast trends of fuel prices in post-war years.

It is encouraging, however, to note that the Minister of Fuel has stated that new houses "must be equipped for any form of service, gas, electricity or solid fuel,"[55] and there is no doubt that this is technically, economically, and sociologically right.

Gas and coke have all the advantages of smokeless fuels over household coal. Gas appliances are definitely more labour-saving than either coal or coke appliances. Of the solid fuels coke gives the highest efficiency.[62] All coke consumptions given in this paper are for modern appliances with improved control of air for combustion, &c.

Cost Considerations.

The new heating standards, desirable as they undoubtedly are, will be realized in practice only if the cost of fuel does not exceed the amount of money available for fuel. Suitable combinations of gas and coke service make it possible for even the lowest income group to enjoy the new standards.

Pre-war the working class family had available only about 5s. 6d. per week to spend on fuel, excluding lighting. The Ministry of Labour Report [59] quotes 6s. 5d. per week for 1937–8; this includes 11½d. for electricity largely used for lighting. The wartime survey for 1942[60] quotes 6s. 6d. per week for houses and 7s. per week for flats for heating and lighting. Masterman[18] arrives at 5s. 5d. per week excluding lighting for the annual fuel used in the country. The standard was much lower than the one now recommended, largely because raw coal was being used in inefficient appliances to supply the major heating needs.

The choice of fuel and of appliances must be such that the minimum desirable heating services can be obtained economically, but these same appliances should be capable of providing a fuller service if more money for fuel or suitable tariffs become available. It is important to know exactly what can be obtained in the way of extra service and amenities for small additional increases in running cost.

There has, in the past, been a tendency to consider only capital cost of fuel equipment, whereas the total cost of the service to the user is made up of capital, maintenance and running cost, all of which should be taken into account when choosing an installation.

Gas and coke have all the advantages of smokeless fuels over household coal. Gas appliances are definitely more labour-saving than either coke or coal appliances, but of the solid fuels coke gives the highest efficiency.

IIIa. How Gas and Coke can Give the New Standards: Space Heating

Room Heating.

The way of living will affect to a great extent whether one room is in occupation for 12 to 15 hours a day, or whether this period is divided between a room in which meals are taken and a living room. It is clearly better whenever possible to make use of two rooms. If background heating of the house is 50°F. it should be an easy matter to top-up the heating of rooms, as and when they are occupied, by radiant heaters. Radiant heaters are not only attractive in appearance, but they give reasonable comfort as soon as the air temperature reaches 55°F. Any attempt to give, with precision, background heating throughout the whole house at 50°F., however, creates two problems new to the small type of house.

Firstly, at least one appliance must be in continuous operation throughout the 14 cold weeks or the temperature will drop below 50°F. at night.

Secondly, the heat output required from the main appliance is less than in the past, as it is only required for topping-up and not for complete heating. Sometimes, however, it may be desirable to use an appliance capable of giving complete heating during periods of occupation with or without background heating at other times.

It is very debatable whether or not any attempt should be made to maintain bedrooms at 50°F. at all times. Although information is lacking on the precise amount of heat which will reach the first floor from the ground floor, it is anticipated that a temperature of at least 45°F. will be obtained upstairs even if no special provision is made, provided that the heating standards of the kitchen and living room are adequate.

It will be seen from Appendix 2 that typical total heat requirements of a small house in the South of England are:

For background heating	87 useful therms* per annum.
For topping-up	116 ,, ,, ,,
Total	203 ,, ,, ,,

* The term "useful therm" is used in quoting heat requirements as distinct from "therm," a measure of gas consumption.

The requirements for the different heating periods of the year are also shown. The living room accounts for about one-half of the total heating of the house and the meals room about one-quarter.

In estimating consumptions it is necessary to sum the heat contributed by all the appliances in order to check whether or not the full heat requirements of the house are satisfied. In practice the theoretical heat requirements may be exceeded, especially in the mild weather, as they assume a very precise control of heat outputs by the user. Gas makes it possible to approach the theoretical figures reasonably closely, and a combination of gas and coke shows a marked advantage over the coke appliance alone. Coke appliances are less flexible, and at times the fuel consumption is dictated by the minimum rate of combustion at which the appliance can be used rather than by the exact service required by the user. Also for short period use the initial load of a coke appliance determines the minimum amount of fuel used and the minimum period of occupancy.(63)

If a coke appliance provides both hot water and room heating, it is still more difficult to avoid exceeding the theoretical heat requirements. Modern coke appliances with more precise control of the air for combustion give increased flexibility compared with pre-war.

Living Room.

Gas.—Gas is of special importance as a means of providing full heating in the mild weather and background heating in the very cold weather. Under these conditions the flexibility of gas makes it competitive in running cost with coke.

Mild Weather Heating.—The 8 mild weeks of the 30 winter weeks require about 10 useful therms. If the heating season is extended to 39 weeks the extra 9 weeks only require about 4 useful therms. The consumption of a flueless fire in the milder weather would therefore be 10 to 15 therms.

As alternatives, a portable fire standing in front of the fireplace or a flued fire built-in as an integral part of the coke fire would use about 20–30 therms, and for the same service would be of better appearance when alight.

Many types of flueless fire are available, and the majority are of the reflector type with a maximum rating of about 5,000 B.Th.U. per hour.

Several fires of the screen type are available to stand in front of a fireplace and are normally rated at 10,000 to 12,000 B.Th.U. per hour.

Only one type of gas fire integral with a coke fire is at present available.

The future development of all these appliances will be in the direction of improved appearance and decreased maintenance, with special attention to much more robust radiants and possibly non-aerated burners.(64)

It is expected that entirely new designs of integral gas and coke fire will be produced.

Background Heating.—If the appliance giving the main heating is not operated continuously in the 14 coldest weeks, it is possible to get all the required background heating by a gas-fired background heater for a consumption of about 25 therms.

There are several types of suitable flueless heater designed to be unobtrusive and of a suitable shape to fit under a window or on any convenient wall. Heating is almost entirely by convection, and special care is taken in their design to minimize the risk of wall discoloration. These heaters are normally rated at only 3,000 B.Th.U. per hour, and are intended to be used continuously during the coldest spells.

Complete Heating.—A living room requires about 100 useful therms for full heating, or about 60 useful therms for topping-up. For such long-period heating the convector gas fire is preferable to the purely radiant type, as the overall efficiency is substantially greater. A convector gas fire would use about 160 therms for complete heating or about 100 therms for topping-up.

Only a limited range of these fires is available, but new designs will shortly be on the market. These new fires will not only have a high efficiency, but will include very robust radiants and possibly non-aerated burners to reduce maintenance. In addition they must give flexibility of heat output without sacrificing overall efficiency or appearance when alight. This flexibility is an essential feature of any appliance used for long periods and during the whole heating season.

Coke.—There are three main types of appliance to be considered:

The Open Coke Fire.—This gives a pleasing and traditional open fire. It provides the complete heating of a room, and in addition gives some extra background heating to the house. At the moment these fires will not keep in over-night, but it is expected that such a fire will shortly be available. It would then make a greater contribution to background heating during the coldest weather. Gas ignition is standard, and a plug point should be provided for the use of alternative gas heating in the mild weather. The rate of coke consumption can be raised from just under 1 lb. per hour to just over 2 lb. per hour. The coke fire may with advantage be boxed in, so that an extra amount of heat is obtained as warm air from the casing of the fire. This convected heat can be used to provide background heating in the living room, or may be ducted to the kitchen or other parts of the house.

The Independent Coke Fire.—Without any additional convector chambers or devices the coke fire can be used as a free-standing model giving more heat into the room than the conventional inset fire.(65) This gain in efficiency means some sacrifice in appearance and some increase in capital cost.

Openable Slow Combustion Stove.—This gives a substantially higher overall efficiency than the open fire, and with certain grades of coke can be operated continuously. The maximum rate of consumption is about 2 lb. per hour. The gain in efficiency is at a sacrifice of appearance when alight, and at an increase in capital cost; it is not known to what extent it will prove popular with the public. The extra convected heat from the fire can, if required, be directed to provide background heating in other parts of the house.

Coke Appliances with Back Boilers.—Each of the above appliances can be fitted with a back boiler adequate to give a full hot-water service. The addition of a back boiler results in an increase in coke consumption, and often a longer period of operation than that strictly necessary for providing heating requirements.

Table II gives approximate fuel consumptions for a period of occupation of 60 hours a week and 90 hours a week for 30 weeks and 39 weeks. The 90-hour week is more probable with the back-boiler.

TABLE II.—Approximate Fuel Consumptions of Coke Appliances.

Appliance.	Annual Consumption, cwt. 30 weeks. 60 hrs. a week.	30 weeks. 90 hrs. a week.	39 weeks. 60 hrs. a week.	39 weeks. 90 hrs. a week.
1	2	3	4	5
Open coke fire	25 to 30	30 to 35	30 to 35	35 to 40
Independent coke fire	20 ,, 25	25 ,, 30	25 ,, 30	30 ,, 35
Slow combustion stove*	25 ,, 30	30 ,, 35	30 ,, 35	35 ,, 40
Open coke fire + back boiler ...	—	35 ,, 40	—	45 ,, 50
Independent coke fire + back boiler	—	30 ,, 35	—	40 ,, 45
Slow combustion stove + back boiler*	—	35 ,, 40	—	45 ,, 50

* In operation continuously during the 14 coldest weeks.

Meals Room and Kitchen.

The meals room will often be part of the kitchen or receive a substantial amount of heat from the kitchen. Full comfort will only be required at meal times, but a higher background temperature than that of the rest of the house will be needed in these rooms for the first 8 hours of the day. The heat requirements are about one-half those of the main living room.

Gas.—A flueless gas fire or a flued gas fire would give the extra warmth needed for comfort in the cold weather when the incidental heat of the kitchen is not adequate. If there is no background heating from the living room the following consumptions are expected:

Convector gas fire	50 therms, or—
Flueless gas fire	30 ,,

If background heating is provided from the living room these consumptions would be about 25 and 15 therms.

Coke.—If a coke boiler is used to provide hot water it will also satisfy the full heating requirements even in the cold weather. There will be a tendency to give an excess of heat over that really necessary for 16 weeks of the heating season, and for the warmest 22 weeks of the year some overheating will be inevitable.

Coke consumption figures are considered under the hot-water service and no extra fuel is needed to provide kitchen heating.

Hall and Landing.

Some heating will be needed in the coldest 14 weeks.

Gas.—Flueless gas heaters, either of the background-heater type or the radiant type, are available either as free-standing appliances or for fitting to a wall. The estimated annual consumption is 25 therms.

Coke.—A small hot-water radiator of about 12 sq. ft. surface can be connected to a coke boiler of the minimum size or with less satisfactory results to a back boiler. The hot-water tank must be lagged.

Estimated additional annual consumption is 5 to 10 cwt., from which 35 to 70 useful therms will be obtained as background heating.

Bedrooms.

A radiant gas fire gives the extra warmth needed for dressing and undressing in the cold weather. If the house is warmed adequately on the ground floor and landing it is unlikely that additional background heating will be needed in the bedrooms. A convector-type fire should preferably be fitted in one bedroom in order to give economical use for long-period heating—*e.g.*, during sickness.

The use of a solid-fuel fire for this purpose has been suggested, but may be undesirable because of the extra labour involved at such a time. The estimated annual consumption for 3 bedrooms is 20 therms.

Bathroom.

A towel rail can be connected to the coke boiler. Alternatively a small flueless reflector gas fire, preferably fixed to the wall, can give the intermittent heating required in the really cold weather. The estimated annual consumption is 2½ therms.

Insulation.

The above consumptions refer to the conventional type of building construction. If the new standards of insulation suggested in the Code of Functional Requirements are adopted there will be a saving of fuel of up to about 20%, or alternatively a smaller saving with improvement in comfort conditions in the really cold weather.

IIIb. How Gas and Coke can Give the New Standards: Water Heating

Any choice of water-heating appliance must take into account the amount of hot water to be used and the different usages at the sink, the basin and the bath. Table III gives an approximate idea of the frequency of use and the average quantity used at the various points during one week:

TABLE III.—Hot Water Used at Sink, Basin, and Bath.

	220-gall. Standard.	350-gall. Standard.
Sink	60 times = 80 gall.	90 times = 110 gall.
Basin	30 times = 30 gall.	50 times = 50 gall.
Bath	6 times = 110 gall.	10 times = 190 gall.

Gas is particularly suitable for meeting these varying and intermittent uses with economy and certainty. The gas consumption will be approximately proportional to the hot water used, whereas the coke consumption will depend more on the minimum rate of combustion. If, however, the coke appliance gives substantial room-heating as well as hot water, this dual use will normally make coke more economical than gas in the cold weather.

Gas has a special purpose to serve for summer water-heating. It should also be considered as supplementary to solid fuel in the winter and as an all-the-year-round service.

In the past small quantities of hot water for sink use and for ablutions were frequently obtained from a kettle on the gas cooker. This was economical, but is inconvenient for the amount of hot water now regarded as desirable.([67], [61])

Characteristics of Gas Water Heaters.

The following types of gas water heater are available to give full service:

Sink Heaters.—These have a small heat capacity, and give the lowest gas consumption for the small quantities of hot water needed intermittently at the sink. They are fitted at the sink into which they deliver directly, but by means of a swivel spout they can also be used to fill the wash boiler. Instantaneous heaters with open water-ways and storage heaters show advantage in maintenance over the more common nstantaneous type with closed water-ways. Open type heaters show some advantage in running cost owing to their lower heat capacity. On the other hand, some heaters of the closed type are available which will give water at temperatures up to boiling. Owing to the intermittent usage a flue is not normally needed.([71])

Instantaneous Bath Heaters: Open-type or Closed-type.—These are fitted over the bath and deliver directly into it. They give the lowest gas consumption for bath use. A swivel spout may be provided to supply water to the wash basin. A flue is essential, and there should be adequate air inlets to the bathroom.([71])

Instantaneous Multipoint Heaters.—These supply hot water at sink, basin, and bath, as required, from the one appliance. It is important to fix the heater close to the sink in order to reduce the waste of hot water in the pipes between the appliance and the point of use. Hot-water pipe runs should be as compact as possible in order to avoid delay in the supply of hot water and to reduce gas consumption. Some of the new plumbing units have advantages in this respect.

This type of heater must be large enough to give a quick bath, but the heat capacity of the appliance somewhat reduces economy of obtaining small quantities of hot water at the sink and wash basin. Only for summer water heating is it advantageous to use a smaller model than the one required for all-the-year-round water heating. Whilst still giving a reasonably quick bath, owing to the higher summer water temperature it gives more economical use at the sink because of the smaller heat capacity. Heaters of this type incorporating a valve which operates at a very low head of water (3 ft.) have been specially developed to be available for the "Portal" house.

The heaters can either be free-standing or can be built into a cupboard or recess. If the heaters are built-in it is essential to use a special front outlet baffler: such bafflers have been designed at Watson House and shown at Northolt.

Circulators.—These supply hot water to a storage tank which is normally the storage tank of a solid-fuel hot-water system. Although gas circulators and coke boilers perform the same function there is an important difference, as circulators are thermostatically-controlled to give a flow temperature of about 140°F. and are fitted with restrictors so as to give this temperature with cold inlet water. In consequence, hot water is available from the top of the tank before that at the bottom has begun to be heated at all. This enables the circulator to be used intermittently although, of course, the best service is obtained by continuous use. Intermittent use shows a marked economy, and fullest advantage from it is obtained with a circulator of high output.

The greatest advantage over the instantaneous heater is the delivery of water, equally hot at all seasons, at a rate only limited by the available heat and the bore of pipe and delivery tap.

The tank and flow and return pipes must be lagged([78]) to minimize standby losses, and for most economical running the whole system should be as compact as possible, If there must be a long pipe-run from the tank to the points of use it is an economy to provide a full-sized draw-off for the bath and a separate smaller pipe for the sink and wash basin. There should be no inter-circulation with any alternative water-heating circuit, and preferably independent connexions should be made to the tank.

Circulators can either be free-standing, or they may be built into a recess, providing a satisfactory front outlet baffler is used.

Storage Heaters.—These are similar in principle to the circulator, but the storage tank is an integral part of the appliance. This results in reduced running cost as the tank can be of an ideal shape for stratification, the flow-and-return can be internal and lagging of the tank of a very high standard.

Storage heaters can be operated continuously or intermittently. They can serve as the storage cylinder of a solid-fuel hot-water installation.

Summer Water Heating.

Coke.—The coke boiler being essentially a water-heating appliance, and in the kitchen, may be used intermittently for baths in the summer without serious inconvenience from over-heating. Running costs, however, do not justify its use for other purposes. In the South of England the use of coke for these purposes might be extended to 39 weeks, but 30 weeks is more normal and desirable. The summer consumption for baths is about 10 cwt. (22 weeks).

The coke appliance with back boiler, being essentially a room-heating appliance and in the living room, is unsuitable for any purpose in the summer. The winter use might be extended to 30 weeks, but should preferably not exceed 22 weeks.

Gas.—It is clear that some alternative to solid fuel is necessary for the summer, and any of the suggested gas systems can be used for complete summer water heating. If a lagged storage tank is available the best service is obtained at the lowest capital cost by the use of a circulator, but running cost should be balanced against these advantages. The use of a circulator for baths only, plus a sink heater for the sink, gives an almost ideal combination—very rapid delivery at sink and economy in running cost. The circulator is also available to provide a more complete service as and when the user desires it. If a coke boiler is acceptable as a method of getting baths in the summer, then a sink heater should be used in combination with it.

Winter Water Heating.

Coke.—A coke boiler, with lagged tank and in continuous use, will give the higher standard of 350 gall. a week; and it is unlikely that the coke consumption would be reduced for the lower standard of 220 gall. Some care is needed by the user to ensure that the right amount of hot water is available at the desired temperature at the right moment. The boiler can be kept in continuously at night and the value of doing this to give background heating should be remembered.([66]) The estimated annual consumption for 30 weeks is 25 cwt.

A coke fire or slow-combustion stove with back boiler will give the full hot-water service as well as heating the living room: consumption figures have already been quoted. The problem of availability of hot water as required is rather more difficult than with the coke boiler.

Gas.—Any of the systems of gas water heating can be used, but particular attention must be paid to the running cost. They should

be considered from the point of view of all-the-year-round hot water, as the same system would be used during the summer months.

Use of Gas to Supplement Solid Fuel.—In addition to its use for summer water heating, a gas appliance can serve a useful purpose as a booster when the quantity or temperature of hot water from a solid-fuel appliance is inadequate. The simplest method is to use a circulator. Another possibility is to connect an open-type or storage sink heater to the hot-water supply instead of to the cold feed.

Practical Gas Consumption for Water Heating.—Although the full heat transfer efficiency of all gas heaters is about 75%, the practical or useful efficiency will depend on consumer habits, the type of appliance, the amount of hot water used and the actual lay-out of the system. The operation of these factors is discussed in some detail in Appendix 3, which gives results of tests in which the actual quantities of hot water required were drawn off at the desirable temperature at the sink, bath and wash basin at times representative of normal household habits. It also gives the results of comparative tests on performance and running cost of the electric immersion-heater and a small gas multi-point for the Portal house. The gas consumption for different levels of hot-water service obtained by different types and combinations of gas appliances are given in Table IV, which is based on this Appendix.

TABLE IV.—Fuel Consumptions for 220-gall. and 350-gall. Hot-water Standards.

Note.—The figures for therms per annum have been rounded to the nearest 5 therms. Consequently the therms per week may not exactly agree with the figures given in Tables VIII–XI.

Appliance.	220-gall. Standard (excluding Wash Boiler): equivalent to about 150 gall. at 140° F.				350-gall. Standard (excluding Wash Boiler): equivalent to about 250 gall. at 140° F.			
	All-the-year-round Service.		Summer Service (22 weeks).		All the-year-round Service.		Summer Service (22 weeks).	
	Therms per week (average).	Therms per annum.	Therms per week (average).	Therms per season.	Therms per week (average).	Therms per annum.	Therms per week (average).	Therms per season.
1	2	3	4	5	6	7	8	9
*Sink heater, sink use only)	(1.35)	(70)	(1.15)	(25)	(1.82)	(95)	(1.59)	(35)
(†Sink heater, sink use and ablutions) ...	(1.65)	(85)	(1.45)	(32)	(2.60)	(135)	(2.27)	(50)
Sink heater + single-point bath heater ...	2.5	130	2.05	45	3.96	205	3.40	75
Sink heater + circulator for baths	2.8	145	2.5	55	4.43	230	3.85	85
Small multipoint	2.8	145	2.5	55	4.43	230	3.85	85
Large multipoint	3.0	155	2.75	60	4.90	255	4.32	95
Circulator (intermittent)	4.25	220	3.65	80	5.95	310	5.23	115
Storage (intermittent)	3.35	175	2.95	65	4.72	245	4.32	95

* 60 gall. at 140° F. for the 220-gall. standard and 90 gall. at 140°F. for the 350-gall. standard.
† 80 gall. at 140°F. for the 220-gall. standard and 130 gall. at 140°F. for the 350-gall. standard.

Water-Heating Development.

Developments are particularly active to reduce maintenance costs still further and to narrow the gap between the bench efficiency and the practical efficiency under normal household conditions of use. The following examples are typical:

Circulator and sink heater combined in one appliance.

Modified design of storage heaters and circulators to improve performance when used intermittently.

Improved types of divided storage vessel so that small quantities of hot water can be obtained more speedily and cheaply.

Appliances with reduced heat capacity.

Combined gas and coke boilers or gas and coke back-boilers so that one appliance can give hot-water service with either or both fuels.

Improved appliance for boosting the hot-water supply from a solid-fuel heater.

IIIc. How Gas and Coke can Give the New Standards: Cooking and Other Services

Cooking.

Gas rather than solid fuel should be used all the year round for all cooking purposes. The average consumption for full cooking service for a family of four has been established at about 80 therms per annum.[30, 29, 1]

Coke.—A solid-fuel heat-storage cooker is more expensive, more bulky and much less flexible than gas, and could only be justified if there were a substantial saving in running cost. The combination range is even less of a competitor, as it has these disadvantages to an even greater degree, and even with modern heat storage cookers and combination ranges the extra coke needed for cooking exceeds ½ cwt. per week.[89] Coke at 45s. a ton only becomes competitive in running cost with gas at 9d. a therm when the average weekly consumption is less than ½ cwt., or ½ lb. per hour.

Gas.—Gas cookers may be free-standing or built-in, as required. The built-in models are designed with front thermostats, and special lips to catch spillage and keep it away from the joints and surfaces of adjacent equipment; and arrangements are made to ensure free discharge of the products of combustion from the oven. Special attention is paid to access for maintenance without disturbing the appliance. The building-in of cookers in low-income group houses is a new development in this country, and useful experience will be gained in the "Portal" houses.

There are also three types of cooker differing in the relative position of the oven and hotplate. In the vertical type the hotplate is immediately above the oven: some stooping to the oven is required, but the minimum space is occupied by the cooker itself.

In the horizontal range-type of cooker the hotplate and oven are side by side, and the top of the oven is on the same level as the hotplate. This reduces the degree of stooping when using the oven, and the top of the oven gives a flat working space.

In the horizontal eye-level type of cooker the oven is at the side of the hotplate and the top of the oven is raised above it. This eliminates stooping to the oven, but does not give the extra working space of the range type and tends to cramp one side of the hotplate.

If a complete unit of cooker plus cupboards is considered as a whole, these wider cookers need not take up any more room in a kitchen and they do not involve any marked increase in capital cost.

Developments since 1939 have been mainly on the lines of easier cleaning of the oven and hotplate, reduced maintenance, reduction in simmering rates, and more even and efficient grilling. Considerable progress has been made in the standardization of overall dimensions and thermostat settings. Developments of new and more efficient types of burner, (including those of the non-aerated type),[82, 64] solid or semi-solid hotplates,[83] and improved finishes to make cleaning even simpler, are very active. A still further increase in efficiency is possible using finned base kettles, new types of which will be available after the war.

Laundry.

Boiling.—A gas wash-boiler of 8-gall. nominal capacity is needed. The boiler may either be of the portable type, which can be pulled out from a convenient cupboard and then plugged into a gas point, or it may be fixed next to the sink. The portable type should have lugs fitted to take a wringer and castors on two legs. The lugs for the wringer should be above the fixed legs to give stability when the wringer is in use. It is an advantage if the boiler can be filled from the hot-water supply; a rating of 15,000 B.Th.U. will then give boiling in less than ½ hour.

A fixed boiler is preferable to a portable one and can have a fixed waste for drainage purposes. The normal position is beneath a detachable or hinged draining board. It is generally a simple matter to include the wash boiler as part of a built-in sink and cupboard unit, and to arrange for a concealed wringer to be swung into position when required.

An alternative to the wash boiler is a heated sink. This is shallower than the conventional wash boiler and has a heating burner underneath; it can be used as a normal sink when not needed for laundry purposes.

The cheapest type of wash boiler in 1939 had a plain bottom; but simple finning has made it possible to increase thermal efficiency. The estimated annual gas consumptions are:

Plain bottom . . .	10 to 15 therms
Finned bottom . .	7 to 10 „

A washing machine incorporates an agitator and a wringer. The agitator may be hand operated or the agitator and wringer electrically operated. The washing machine may be portable or built-in. The portable model, tending to be larger than a portable wash boiler, can be conveniently accommodated under an eye-level refrigerator.

Future developments tend towards still simpler construction, with higher efficiencies and possibly an extension of the heated-sink principle. A flue is not normally needed.[71]

Drying.—This may be either self-contained or a cupboard converted by the addition of a gas burner, distributing shield, drying rods, air inlets and outlets for steam and products of combustion. A fan connected to the outside air may be used to aid the removal of steam and to increase the circulation inside the cabinet.

If a cupboard is converted, care must be taken to ensure that there is adequate heat input to remove the water from the clothes, as well as uniformity of temperature and adequate volume of air. It is important that the drying rods should be at least 1 in. diameter so that hanging clothes do not cling together.

TABLE 5.—*Fuel Service Requirements*

Plan	Space Heating: Living Room: Winter	Space Heating: Living Room: Mid Weather	Space Heating: Kitchen	Space Heating: Bedrooms	Space Heating: Bathroom	Space Heating: Hall	Space Heating: Winter	Hot Water: Summer: Kitchen	Hot Water: Summer: Bathroom	Cooking	Refrigerator	Laundry: Clothes Washing	Laundry: Clothes Drying	Laundry: Ironing	Laundry: Airing
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1A Kitchen-dining alcove. (Example III, Housing Equipment).	Coke fire, built-in ignition.	Portable heater, plug point.	Coke boiler, plug point poker and iron.	Gas fires	Fixed radiant heater.	Convector.	Coke boiler.	Instantaneous sink heater.	Coke boiler in kitchen.	Vertical cooker, built-in.	1·5-cu. ft. eye-level.	Built-in wash boiler.	—	Iron on flex; plug point near coke boiler.	Hot-water tank.
1B Kitchen-dining alcove.	Coke fire, built-in ignition.	Portable heater, plug point.	Coke boiler, plug point poker and iron.	Gas fires.	Fixed radiant heater.	Convector.	Coke boiler, built-in.	Instantaneous sink heater.	Circulator in kitchen.	Vertical cooker, built-in.	1·5-cu. ft. eye-level.	Built-in wash boiler.	—	Iron on flex; plug point near coke boiler.	Hot-water tank.
1C Kitchen-dining alcove.	Coke fire, with back boiler, built-in ignition.	Portable heater, plug point.	Convector gas fire and warm air from coke fire.	Gas fires.	Fixed radiant heater.	Convector.	Back boiler.	Storage sink heater.	Small bath heater, open type in bathroom.	Vertical cooker, built-in.	1·5-cu. ft. eye-level.	Built-in wash boiler.	—	Iron on flex; plug point in dining alcove.	Hot-water tank.
1D Kitchen-dining alcove	Coke fire, built-in ignition.	Portable heater, plug point.	Convector gas fire.	Gas fires.	Fixed radiant heater.	Convector.		Storage heater, quick recovery.		Vertical cooker, built-in.	1·5-cu. ft. eye-level.	Built-in wash boiler.	—	Iron on flex; plug point in dining alcove.	Gas heater.
1E Kitchen-dining alcove	Convector gas fire.		Convector gas fire.	Gas fires.	Fixed radiant heater.	Convector.		Multipoint instantaneous.		Vertical cooker, built-in.	1·5-cu. ft. eye-level.	Built-in wash boiler.	—	Iron on flex; plug point in dining alcove.	Gas heater.
2 Dining kitchen + utility room (Housing Manual, Figure 74).	Convector gas fire and radiator off coke boiler.		Built-in coke boiler, plug point, poker and iron.	Gas fires.	Towel rail off coke boiler.	Radiator off coke boiler.	Coke boiler.	Built-in circulator.		Range-type. built-in.	1·5-cu. ft. eye-level.	Built-in washing machine.	Built-in flue exhaust.	Ironing set; plug point near coke boiler.	Hot-water tank.
3 Working kitchen, dining alcove in living room (Alternative II, Design for Dwellings)	Openable stove with back boiler, plug point for poker		Warm air from openable stove.	Gas fires.	Towel rail off openable stove.	Convector.	Back boiler.	Small multipoint instantaneous, built-in.		Range-type.	1·5-cu. ft. eye-level.	Built-in wash boiler.	Built-in flue exhaust.	Ironing set; plug point on cooker.	Hot-water tank.
4 Kitchen-living room and scullery (Alternative III, Design for Dwellings)	Coke fire with convector, back boiler, and built-in ignition	Gas, integral-type inset in coke fire	Sitting room Convector gas fire and warm air and radiator off coke boiler.	Gas fires.	Bowl fire, plug point.	Convector.	Back boiler.	Storage heater, slow recovery.		Eye-level, free-standing.	3-cu. ft. eye-level.	Heated sink.	Built-in fan exhaust.	Ironing set on cooker hotplate.	Hot-water tank.

NOTE: COL. 12, LINE 11, SHOULD READ 3 CU.FT.; LINE 13, 3 CU.FT.

A full load of clothes should be dry, to the ironing stage, in less than 1 hour. A proportional top or some temperature control is needed so that woollens can be dried at a lower temperature than cottons.

A suitable drying-rod length for the normal wash is about 25 ft., and a suitable heat input is about 12,000 B.Th.U. per hour.

It is essential that the ventilation of the kitchen should be satisfactory in order to dilute the water vapour from the clothes, and preferably this vapour should be discharged into a flue. The estimated annual gas consumption is 15 to 20 therms.

Future developments tend towards the built-in type of cabinet and the simplest conversion of standard kitchen units to include a gas unit for drying.

Airing.—Small gas units, similar in principle to background heaters, rated at only about 500 B.Th.U. per hour, provide a method of heating a linen cupboard as required. Ventilation should be provided through the cupboard by a slot or holes at the top and bottom. The estimated annual consumption is 10 therms.

If a lagged hot-water storage tank is used in the linen cupboard or if hot pipes run through the cupboard it is not necessary to add a separate heater.

Ironing.—There are two main types of gas iron; one contains a burner as an integral part, and the other is an ironing set in which the iron is heated internally but the burner is part of a stand from which the iron is removed for use.

Developments are likely to take place in the direction of the ironing set, as the absence of any tube or flex makes it more convenient to operate.

The estimated annual consumptions are:

Internally-heated type . .	2½ therms.
Externally-heated type . .	4 ,,

Refrigeration.

The gas refrigerator relies on the absorption principle and eliminates mechanical wear and tear. All models rely on natural circulation of air for operation, and they can either be free-standing or built-in to a kitchen unit. Preferably they should be built-in above floor level for easy access by the user, but if no suitable space is available they can be built-in below the draining board.

Sizes from 1 to 10 cu.ft. are available, but the 1½ cu.ft. model is the most practical choice when space is limited; it is adequate for the storage of the normal perishable foodstuffs. A 3 cu.ft. model is probably the most suitable size if space is available and capital cost permits.(5)

Recent developments have resulted in lower capital costs and even lower maintenance costs than pre-war.

The estimated annual consumptions are:

1½ cu.ft. size	50 therms.
3 cu.ft. size	65 ,,

Ignition of Solid Fuel.

Gas ignition is always incorporated in open coke fires. For coke boilers, openable stoves and coal fires gas pokers are used.

Ventilation.

Gas fire flues of about 30 sq. in. provide adequate ventilation in bedrooms. It is desirable to use a flue of at least 50 sq. in. in the kitchen and living room so that freedom of choice is given for coke as well as gas appliances. The living-room flue should also be large enough to sweep, in case raw coal is used.

It is important that full advantage should be taken of the ventilating capacity of the flues in the living room and kitchen. If a coke boiler, slow combustion stove or other appliance with restricted air inlets is used there should be additional air entry to the flue, preferably at ceiling level.

The acceptance of a flue as the desirable method of ventilating a room agrees with the general technical experience of the Gas Industry, and is confirmed by many tests carried out at Watson House. Compared with an air-brick, a flue gives a more consistent rate of air change in a room and, even if there is no source of heat at the base of the flue, gives an increased air change when a room is heated.(84, 85) The recognition of the importance of flues makes it essential to consider the simplest and cheapest methods of providing them in new and reconstructed houses.

At the planning stage of a house it is often possible to group together the flues from the kitchen, living room and two of the bedrooms. A conventional stack may be used, or flue pipes—*e.g.*, in asbestos cement—may be run through a central casing or duct. Pre-cast concrete flue blocks can readily be bonded to standard brickwork, and were widely used before the war as a cheaper alternative to a brick flue. In the past some overheating troubles occurred when gas fires were fitted. These difficulties were due to bad building or bad fitting of the gas fire. It is expected that future flue blocks will standardize on spigot and socket joints to avoid bad alignment during erection and the extrusion of mortar fangs from the joints. Gas fires should be fitted in such a way that there is a definite lead of products of combustion into the flue and adequate excess-air inlets.

Another successful type of flue for gas appliances is a 9 in. by 4½ in. brick flue readily constructed by dividing a 9 in. by 9 in. flue—*e.g.*, by slate.

A major problem, concerning which more information is needed, is that of simple termination of the flue in a fairly exposed position. Ideally a flue should terminate above the ridge level and this is readily done if a proper stack is provided. Termination at a ridge tile is excellent technically and gives a very neat appearance, but in many conventional forms of roof construction the position of the ridge pole raises practical difficulties. It is likely, however, that a special form of ridge tile could be designed with outlets on each side of the ridge pole, and thus avoid the need to cut the ridge pole. It may not always be practicable to terminate flues above the ridge, and under such circumstances wall terminals serve a very useful purpose, and give much better ventilation than that obtained from an air-brick.(86)

It is felt that in the past any difficulties in flue design have been due primarily to lack of full co-operation with the architect at a sufficiently early stage in the planning of a house.

IVa. Examples of Gas and Coke Installations: General

The main purpose of this Paper is to give examples of gas and coke fuel services and estimated consumptions for different plans of small permanent dwellings. Much of the information given is applicable to other types of accommodation for which fuel equipment will be required—namely, other types of existing and new houses, blocks of flats,(12, 16) larger houses converted into flats,(87) "duplex" houses, and "Portal" houses.(77)

The Plans.

The plans shown are not architects' drawings, but illustrative only. They have been chosen to show the widest range of types, and to draw attention to the probable differences in running cost, labour-saving and service. Choice of a particular system will depend on the relative prices of gas and coke, and the value attached to convenience and labour-saving. All the running costs, it should be remembered, are quoted on a pre-war basis with full-price gas, although the annual gas consumptions are in all cases considerably above the pre-war average.

The total floor area of the 3-bedroom type dwelling considered is 900 sq. ft., as recommended in the *Design of Dwellings* (9) for a family of 2 adults and 2/3 children. The layouts are based on the three

"ways of living" referred to in both *Design of Dwellings* and *The Housing Manual*.[30]

Planning.

The lay-outs of appliances, kitchen and the like are consistent with modern recommendations, designed to reduce labour, &c., and the bibliography (Appendix 4), includes references to kitchen and room-planning information.

The Three Ways of Living.

Plans 1A to 1E are all of houses of the same design, but show how varying proportions of gas and coke can be used. This is a dining-kitchen house, and similar to Example III shown in *Housing Equipment*.[28]

Plans 2 to 4, based on the three "ways of living," show further alternative domestic heat services. Each of these plans could be expanded, like Plan 1, to show alternative types of appliances with varying proportions of gas and coke.

Kitchen-Living-room House.—With this lay-out meals are cooked and eaten in the living-room. This type of house was practically the only type built before the last war. The kitchen housed a solid-fuel cooking range, which also supplied room heating and sometimes hot water. The sink and solid-fuel copper were contained in a small scullery leading out of the kitchen-living room. The increasing popularity of gas for cooking, first as a summer auxiliary, meant that space had to be found for the gas cooker in the scullery. Later the coal range was removed and a coal fireplace substituted. This converted the room into a living room and all kitchen operations were relegated to the scullery. This was the beginning of the small cramped kitchen.

Working-Kitchen House.—This arrangement contains a living room in which meals are eaten, sometimes in a dining room recess, and a working kitchen which houses the cooking and laundry equipment.

Dining-Kitchen House.—Here the meals are eaten in the kitchen, sometimes in a dining recess, and the living room is kept free for social and recreational activities. (The *Design for Dwellings*, p. 13, notes that a working household often has as many as seven separate meals.) This arrangement allows the housewife to carry out her duties, and still leave room for small children to play where she can see them. Where meals are eaten in the kitchen, especially where there is no dining recess, it is desirable to house the laundry equipment in a separate room or outhouse.

The first is appropriate where only solid fuel is available for cooking; and an example has been built for rural districts at Northolt.[13] The others are much to be preferred where gas or electricity is the cooking agent, and these are, with minor variations, the most suitable for urban districts.

Fuel Service and Fuel Costs.

Fuel Service Requirement.—The fuel service and ventilation is that recommended in Codes of Functional Requirements, as outlined in Section III, and provides: Full comfort in the living room and kitchen—adequate short-period heating of bedrooms and bathroom—background heating for the passages and hall—220 gall. of hot water per week (includes 4 small baths for children and 2 large baths for adults per week, and sufficient hot water for ablutions, washing up, and home laundry)—clothes boiling, ironing and airing, and in some cases clothes drying—cooking and refrigeration for 2 adults and 2 to 3 children.

Table V summarizes the services and the method of obtaining them in each case.

Fuel Costs.—Since no one can be certain of the post-war prices of fuels, the estimated costs are based on pre-war prices of gas and coke—namely, coke 45s. per ton (calorific value: 12,500 B.Th.U. per lb.); gas 9d. per therm. This enables direct comparison to be made with the pre-war family expenditure on fuel, but the figures can easily be adjusted, however, for other prices of gas and coke.

Weekly costs are given as an average over the whole year and also separately for the 30 winter weeks, the 9 cool weeks and the 13 summer weeks.

It is important to realize to what extent the winter weekly cost exceeds the average weekly cost; with gas and coke this difference is less than with gas only. In addition, solid fuel can sometimes be bought during the summer and stored. A suitable tariff reduces the difference for gas.

Comparison of the Different Plans.

Total Useful Heat Available for Space Heating.—At the end of each Table an estimate is given of the total heat output to the house of all the appliances contributing useful heat during the 30 winter weeks. The heat outputs of the cooker, refrigerator and solid-fuel water-heating appliances are included.

This total heat output should be compared with Egerton's estimate of 200 useful therms for the total heat requirements of a small house in the South of England to give the full heating standard of the Codes of Functional Requirements.[51] All examples exceed the 200 useful therms, but considerably less margin is necessary in the all-gas house, as gas appliances can follow the theoretical requirements more closely than solid fuel.

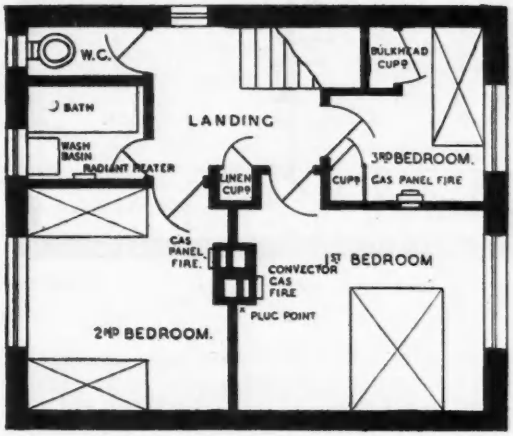
Raw Coal Requirement.—The net raw coal required to produce the gas and coke is given in each case (Appendix 1).

It will be seen that all the plans show a net annual coal requirement of less than 5 tons, and some less than 4 tons, in spite of the very much better service obtained than pre-war, when the net coal usage was often greater than 5 tons.

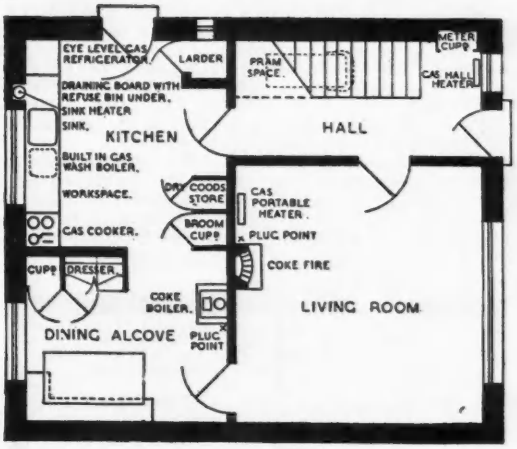
IVb. Examples of Gas and Coke Installations: Variation in Fuel Service

Plan 1A.

A coke boiler is provided for water heating and used continuously, except during the summer, when it is lit for baths twice a week. The front of the boiler, when opened, provides heat in the dining alcove. A plug point is provided for a gas poker; the same plug point will accommodate a gas iron. Summer water heating at the sink is provided by an instantaneous sink heater.



FIRST FLOOR



GROUND FLOOR

Plan 1A.

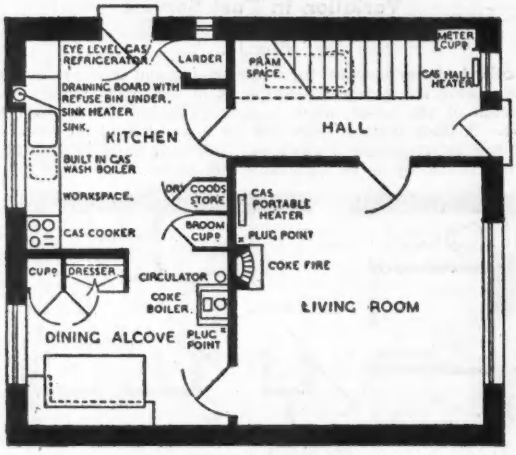
The living room is heated by a coke fire with built-in gas ignition; a plug point is provided for a portable gas fire for use in milder weather. Gas fires are provided in all bedrooms for quick heating while dressing and undressing; the one in the first bedroom is of the convector type so that economical long-period heating can be obtained during illness. A fixed flueless radiant-heater, mounted on the wall, provides bathroom heating. The hall is heated by a flueless convector. The linen cupboard is heated by the hot-water tank.

The cooker is a vertical built-in model similar to that used in the "Portal" house. The gas refrigerator is of 1½ cu.ft. capacity and mounted at eye-level. A built-in gas wash-boiler with removable draining board is fitted next to the sink. The kitchen is ventilated by the 9 in. by 9 in. boiler flue, and the living room by a 9 in. by 9 in. open fire flue.

Plan 1B.

This plan is almost identical with that of the gas-coke house at Northolt[17] and provides complete gas summer-water heating. A circulator is lit for baths, while hot water at the kitchen sink is provided by a flueless instantaneous sink-heater. Overheating of the

kitchen through lighting the coke boiler during the summer is obviated. This arrangement is more economical on running costs than using the circulator for a full hot-water service (see Plan 2 for such an installation). The circulator being connected to a 9 in. by 4½ in. flue provides more kitchen ventilation than in Plan 1A. In other respects the plan is the same as 1A.

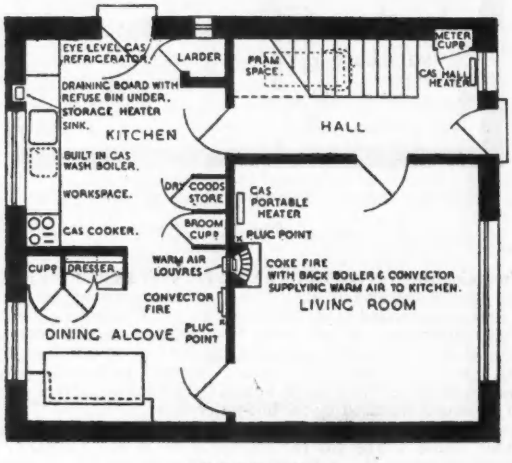


GROUND FLOOR
Plan 1B.

PLAN 1C.

A coke fire with built-in gas ignition heats the living room and a back boiler provides winter hot water; thus there is only one solid-fuel appliance to tend. Summer water-heating is provided by a flueless storage water heater over the kitchen sink, and an open-type bath heater with swivel spout to serve bath and wash basin. As the bath heater will only be used during the summer months, when the inlet water will be comparatively warm, a small heater with a heat input of 60,000 B.Th.U. will suffice. Both these heaters are fitted on the hot-water supply so as to make use of any residual tepid water in the hot tank. This is particularly desirable when a coke fire with back boiler is used for water heating, as this is normally allowed to go out each night and re-lit in the morning; thus even in the winter time it might be useful to be able to reinforce the hot-water supply with gas heating, especially first thing in the morning.

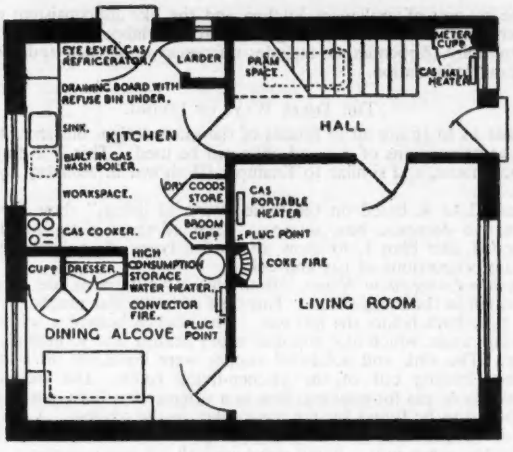
The dining alcove in the kitchen is heated by a convector gas fire supplemented by a warm air duct from the coke fire in the living room, made conveniently possible by the coke fire backing on to the kitchen. A plug point for a gas iron is provided near the fire. Kitchen ventilation is obtained by the flue to the convector fire. In other respects the plan is the same as 1A.



GROUND FLOOR
Plan 1C.

PLAN 1D.

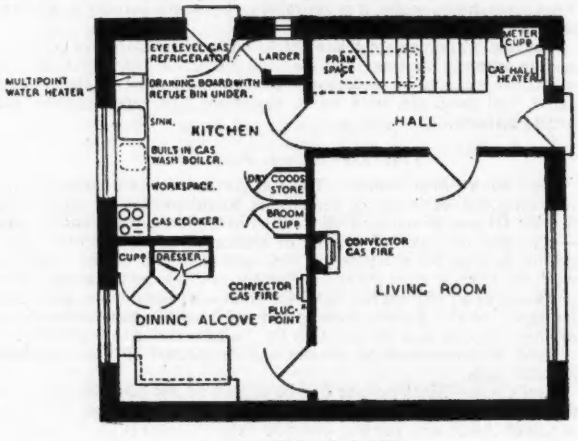
Both winter and summer water-heating are provided by a quick-recovery storage heater, the flue for which provides additional kitchen ventilation. Thus the advantage of only one solid-fuel appliance to tend is obtained as in the previous plan, and, in addition, a fully automatic hot-water service. The dining alcove in the kitchen is heated by a convector gas fire. A plug point for a gas iron is provided in the dining alcove. The linen cupboard is heated by a flueless convector. In other respects the plan is the same as 1A.



GROUND FLOOR
Plan 1D.

PLAN 1E.

This plan is almost identical with that of the all-gas house at Northolt[17] and the service is the most labour-saving, being all-gas. Both winter and summer water heating are provided by a multipoint instantaneous heater. Both the living room and dining alcove in the kitchen are heated by convector gas fires. A plug point for a gas iron is provided in the dining alcove. The linen cupboard is heated by a flueless convector. In other respects the plan is the same as 1A.



GROUND FLOOR
Plan 1E.

IVc. Examples of Gas and Coke Installations: Variations in "Way of Living"

PLAN 2.

The plan is an example of a dining kitchen with utility room.[6] Hot water is obtained during the winter from the coke boiler situated in the dining kitchen, and a gas circulator is used for all summer water heating. A flex socket is fitted close by the coke boiler for attaching a gas poker or a heating unit of an ironing set. Both the coke boiler and the circulator are built-in in a manner similar to that at Northolt.[17]

Background heating for the living room, hall and landing is obtained by hot-water radiators supplied from the coke boiler. The bathroom is heated by a towel rail from the same supply, while the airing cupboard is heated by the hot-water tank.

There is only one solid-fuel appliance to tend, as topping-up heat in the living room is obtained by a convector gas fire. Gas fires are provided in all bedrooms.

The cooker is a horizontal range-type built-in with the sink and work-table, while the refrigerator is of 3 cu.ft. capacity. A built-in washing machine with folding wringer is arranged next to the sink in the utility room. A gas-heated drying cupboard is built into the utility room with ventilation to a 9 in. by 9 in. flue terminating with

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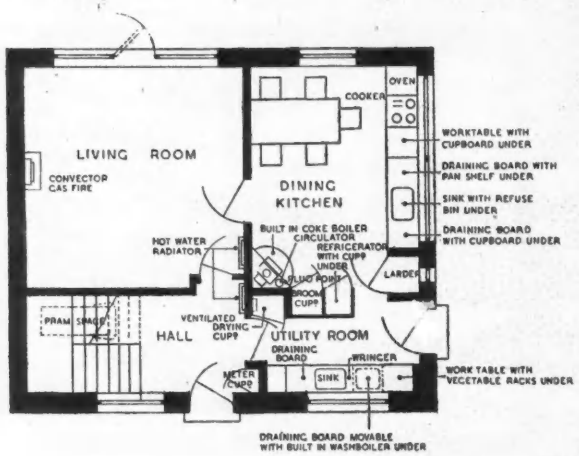
the coke boiler flue above the roof ridge. The circulator is also connected to this flue. This plan, in which coke is used to meet the extra general heat required during periods of severe cold while the labour-saving gas fire in the living room is used for topping-up, is included in the recommendations of the Utilization Sub-Committee of the B.G.F.(58)



Plan 2.

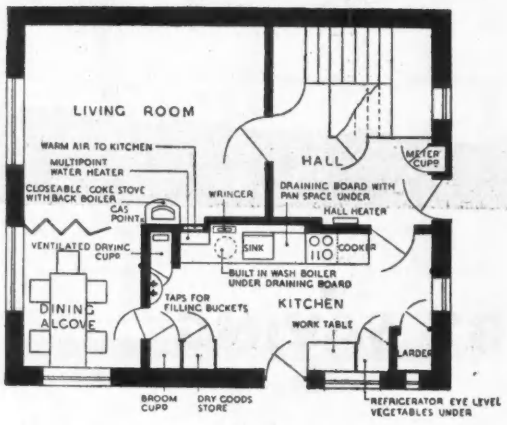
PLAN 3.

This plan has a working kitchen and a dining alcove in the living room.(7)

The equipment is somewhat similar to that in the "Portal" house(77) and prefabricated flats,(14) in that hot water in the winter is obtained from a back boiler on an openable coke stove in the living room, while a heated towel rail from the hot-water tank heats the bathroom, and the airing cupboard is heated by the hot-water tank.

A much better service than in these Government houses is obtained by an adequate summer water-heating supply from a small multipoint instantaneous water heater. A portable gas fire provides mild weather heating in the living room and kitchen, and the hall is heated by a flueless convector. A flex socket is fitted by the openable stove for a gas poker and portable gas fire, and another socket is fitted to the cooker for an iron heater. Ducting from the openable stove provides warm air to the kitchen and top landing, rather than to the bedrooms, as is done in the "Portal" house. The bedrooms are heated and ventilated by gas fires.

The cooker is a built-in horizontal range-type, while a refrigerator of 1½ cu.ft. capacity is built in at eye-level. A built-in wash boiler is arranged next to the sink with a swing-out wringer fitted behind. A gas-heated drying cabinet is built in with ventilation to a 9 in. by 9 in. flue, which also accommodates the flue from the small multipoint heater and in addition provides general kitchen ventilation. The living room is ventilated by the openable stove flue, which has an auxiliary air inlet to the flue at ceiling level.



Plan 3.

(To be concluded)

COMPANY MEETING

United Kingdom Gas Corporation

The Tenth Ordinary General Meeting of the United Kingdom Gas Corporation, Ltd., was held on June 19, at Shell House, 55, Bishopsgate, London, E.C., Mr. BRUCE OTTLEY (Chairman of the Company) presiding.

The Representative of the Secretaries (Close Brothers, Ltd.) having read the notice convening the meeting and the report of the auditors,

The CHAIRMAN said: It is with lighter hearts that we meet this year, the tenth in the history of the Corporation, and with the cessation of hostilities in Europe I shall be able to give shareholders rather more detail upon the Corporation's activities than has been permitted to us in the five years of war.

The accounts are before you and there is little that calls for special comment. You will observe that the net revenue for the year 1944 combined with the carry-forward from the previous year amount to £126,756, as compared with a similar figure of £119,000 shown in last year's accounts. Amounts owing to bankers appear at £508,760, as against £456,468. This is, of course, occasioned by the ordinary development of the Corporation's business, and will be dealt with when the appropriate moment arrives.

Under the heading "Revenue Account," Note 1 calls attention to deposits held in trust by the Corporation on behalf of subsidiary and associated companies, being provisions set aside by them towards repairs and renewals which it has been impossible to carry out in the war years, and upon which we have been able to arrange special interest terms to their advantage.

Note 3 states that no provision has been made for the Corporation's liability, if any, to excess profits tax. In point of fact, your Directors are satisfied that no liability will arise.

On the other side of the balance-sheet, investments in subsidiary companies and other companies appear at £5,692,255, as against £5,599,624 last year. In this connexion it is of interest to note that the total capital employed by the subsidiary companies is £7,533,552, as compared with £5,803,332 at the time of acquisition.

If those figures are correlated to the gas sold by these subsidiaries the capital employed amounts to £694, as compared with £815 per million cu.ft. on acquisition. This may appear to be rather a barren statement, but what it really means is that capital charges in the companies are reduced by approximately 15% to the advantage of the gas consumer.

Under the heading Expenses of increase of capital, items 1 and 2 have been wholly eliminated, leaving only the item of £26,000 representing discount on issue of Debenture stock to be dealt with in the next few years.

The European victory has relieved the strain upon industry in so far as this country is no longer subject to enemy attack; but it must be borne in mind that the war is not yet over, and wartime conditions, exigencies, and priorities still exist, which must be promptly and efficiently met. Anxieties in respect of the supply of coal, labour, and materials are everywhere apparent, and in the sphere of public utility in which we are engaged the difficulties are considerable.

I believe that they will be satisfactorily overcome, and that we shall be able to devote our efforts to improve and expand our services to the public in those areas we are privileged to serve.

During the past year, as you know, the Minister of Fuel and Power has set up a Committee of Enquiry whose terms of reference are:

> "To review the structure and organization of the Gas Industry, to advise what changes have now become necessary in order to develop and cheapen gas supplies to all types of consumers, and to make recommendations,"

and pending the completion of the report of this Committee, and its consideration by the Minister, a virtual embargo is placed upon acquisitions and amalgamations; consequently, schemes of integration, most of which were initiated prior to the commencement of the war, are held up.

This presents a serious and dangerous aspect in that the provision of gas supply is suspended in relation to new houses, new factories, and, in some instances, to the requirements of factories changing over to peacetime production, with the result that the gas service will not be available in some instances in time to meet the demand of the new houses and factories when completed.

The background of the special services rendered by this Corporation's central administration, with gas companies of a size which can be most efficiently operated under their own management, has enabled us to secure results which I do not believe would have been possible under any other organization.

The expansion that has taken place in gas sales during the period of operation of your Corporation during the last nine years, more than five of which have been years of war, has been truly remarkable.

The total gas sold for all purposes in the year 1944 amounted to 10,863 million cu.ft., exclusive of 3,200 million cu.ft. sold in bulk by the West Yorkshire Gas Distribution Company to gas undertakings as compared with 7,029 million cu.ft. in the year 1936, an increase of no less than 54.5%.

The sales of gas to domestic consumers have increased by 1,822 million cu.ft. or 32.2%.

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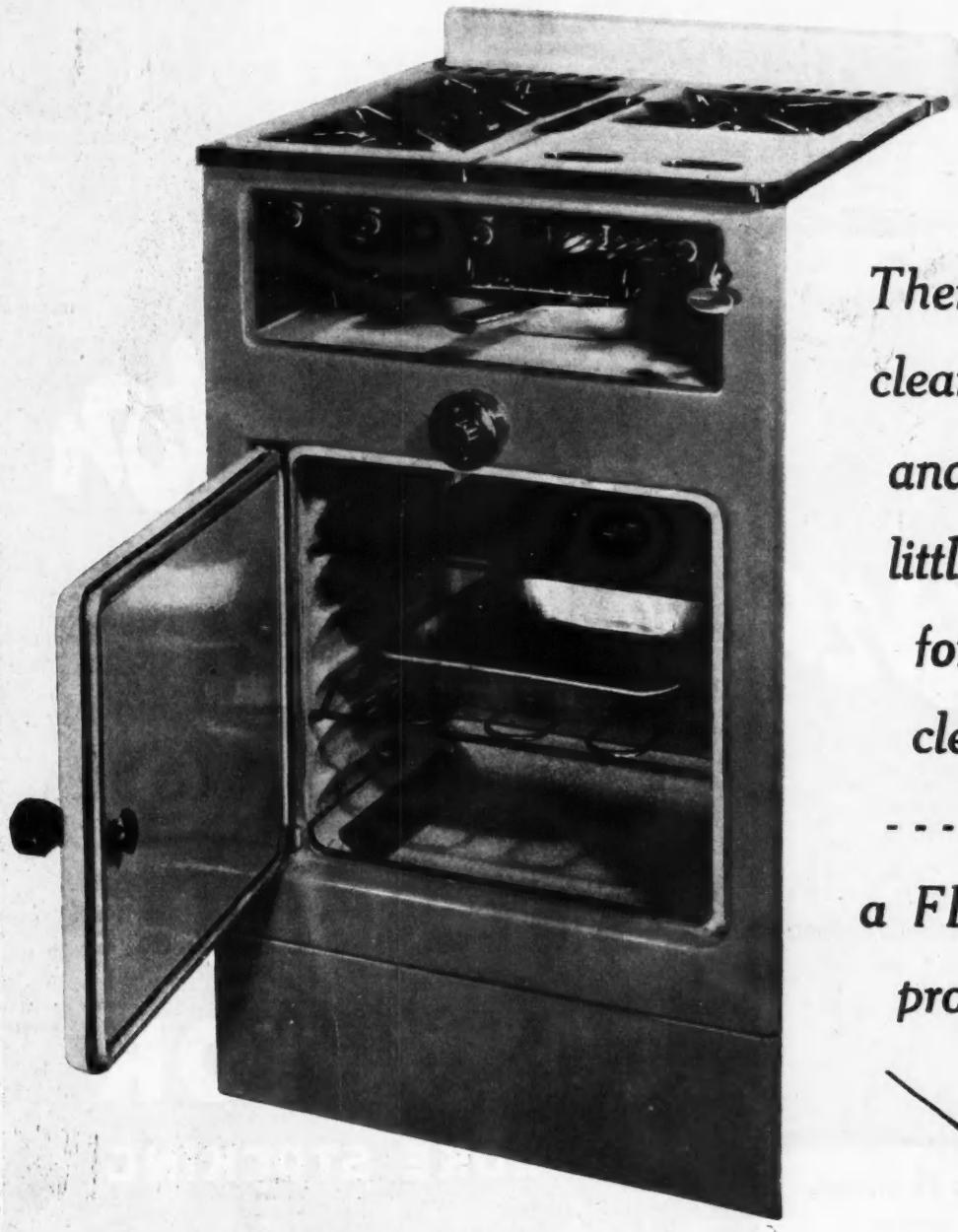

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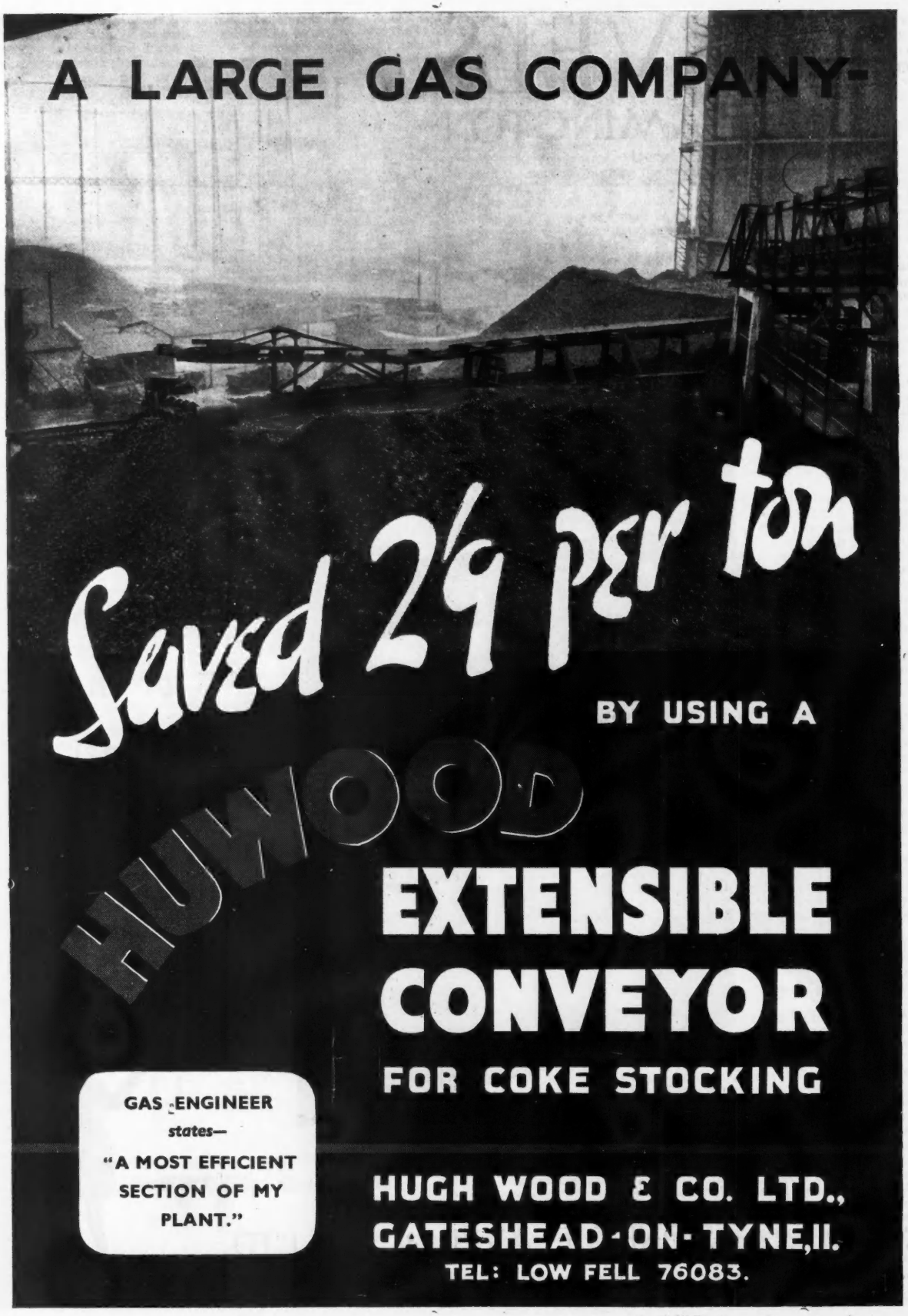
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The sales of gas to industry have, on the other hand, increased from 939 million to 3,140 million cu.ft., or no less than 235%. At least 90% of this increased industrial load has taken place in bakeries, engineering, copper, chemical, glass, and other works existing and operating prior to the war, and the survey of potential loads over the whole of the areas supplied by the Corporation indicates that this load will not only be maintained, but, in reasonable time, will be doubled.

Considering the Corporation's subsidiaries as a whole, the average price received for all gas in 1938 was 9.3d. per therm, and in 1944 10.4d. per therm.

I submit this is a remarkable achievement if one considers the great increases in prices of coal, labour, and all materials. It has been made possible by the improvement and cheapening of the services resulting from the operation of your Corporation, the structure of which, I repeat, provides all the advantages of central control and co-ordination, while decentralizing and developing to the full advantage the individuality and initiative of the managements of its subsidiaries.

I suggest that this is something that could not be achieved by any other system, and certainly not by bureaucratic control, which invariably results in multiplication of officials and the stifling of individual responsibility and enterprise.

I told you a year ago what excellent results had been achieved by the establishment of group working of the Corporation's subsidiary undertakings, and gave some indication of the results.

I would point out, however, that there is a limit to which a group may be extended, and our experience has clearly indicated that undertakings which it is not economic to connect up by gas mains can be combined in groups for administration, when strengthened by the Corporation's over-riding central administration. Similarly, the efficiency of a gas-works—unlike an electric generating station—is not increased when extended beyond a certain size, and so far as distribution is concerned there is a limit to the number of consumers that can be efficiently served and controlled by one management.

As an illustration I would mention the Corporation's Bedford Gas Undertaking, when, despite the fact that the cost of coal has been increased by more than 130%, the average price received for all gas sold was 8½d. per therm in 1944, as compared with 8¼d. per therm in 1938—an infinitesimal increase. It may be fairly claimed that the Bedford price and service compare most favourably with the largest Metropolitan and provincial undertakings, and no advantage would accrue by Bedford varying the present structure as a unit of the Corporation.

Serious errors and increased costs will result from integration unless preliminary investigation and survey are carried to the extent of detailed costing of each minor section of a particular scheme, and desirable as it is to make gas available in rural areas, the service carried out by our technical staff has revealed that it is impracticable in many areas except at excessive cost.

The planning of integration requires not only the most careful investigation and survey of existing distribution systems, but the most careful investigation of existing and potential gas loads, and the correlating of cost of production and distribution from existing centres as compared with possible alternative manufacturing centres. For, if it should prove that economies can be effected by centralized manufacture, they must not be dissipated by increased costs of transmission.

Production of post-war industry necessitates clean and easily controlled heat supplies, and the developments I have indicated have been greatly assisted by our being willing to offer cheap gas to industry.

Our domestic tariffs, on the other hand, have been suspended during the war, but it is our intention to reintroduce them by means of a simple tariff common to all our subsidiaries.

This tariff will provide for a weekly payment of one shilling to meet standing charges and gas consumed will be charged at one-half the declared price; that is to say, in undertakings where the declared price is one shilling, the commodity charge will be sixpence per therm.

A further new development we propose to introduce in connexion with new housing sites is a complete fuel service for the home, involving the use of gas and coke for room heating, cooking, domestic hot water, washing, clothes drying, and refrigeration at an inclusive charge of from seven shillings to eight shillings and sixpence per week on present values, depending upon the area—truly a low cost for the fuel service of an ideal smokeless and labour-saving home.

Among the acquisitions pending, but for which Ministerial sanction is withheld, is that of the Altrincham Gas Company. In order that co-ordination and planning may proceed to meet proposed post-war development of housing and industry, group working has been established between that Company and your Corporation's subsidiaries at Runcorn and Northwich, which now operate as the Mid-Cheshire Group of Gas Companies. These companies now have officials common to all, and the local boards meet jointly for the purpose of co-ordinating administration and planning developments to meet the demand for housing and industry not only within the present areas, but within the intervening urban and semi-rural areas which it is intended to supply in the future.

Our immediate future policy is to complete the integration in so far as may be economic in the areas in which we are operating, and, as I have indicated, we are pressing forward our surveys and investigations to this end. This will in some instances necessitate the acquisition of adjoining undertakings, and I am concerned that the sanction of the Minister of Fuel and Power—in those cases where terms have been agreed—should not be further withheld, particularly as all our schemes are designed to fit in with still further integrations in the event of these proving to be practicable and economic in the interests of the consumer.

Here I would like to repeat once more what I have so constantly stressed in my previous speeches to you—namely, that the interests of the consumers must rank first, and our shareholders will appreciate that the value of their investment is entirely dependent upon our being able to offer a cheap and efficient service that will meet the competition of other fuels.

I should like to express our thanks to the local directors on the boards of our constituent companies who have consented to give us the benefit of their experience of local conditions by continuing in office. This applies in the fullest measure to representatives of local authorities who serve as directors without remuneration, whose co-operation we value most highly and with whom we work on the very best of terms and understanding.

In addition I must take the opportunity of paying a special tribute to Colonel Carr, whose tireless efforts have been beyond all praise, the staffs in London and Manchester, and to our managers and staffs throughout the whole of our undertakings. They have all had heavy burdens to bear throughout the years of war, and I hope that with the return of peace in Europe their personal anxieties and labours will tend to lessen.

Finally, we extend a cordial welcome to those who have been serving with H.M. Forces, and whom we may hope to see returning to us in the not remote future. There is plenty of scope for their energies and ingenuity in the service of the Corporation, once it is permitted to rise like Gulliver from the many and vexatious bonds with which it is at the present time encompassed. Indeed, your Directors look forward with high confidence to the future of this great Corporation, which has made such good progress in integration, cheapening, and improving the gas services in the areas it serves, and which has such a great contribution to make in the conservation of our coal resources.

The Chairman concluded by moving the adoption of the report and accounts.

Managing Director's Views

Col. W. MONCRIEFF CARR, O.B.E., T.D. (Managing Director), said: I have much pleasure in seconding the adoption of the report and accounts, and in so doing would emphasize your remarks, Mr. Chairman, on the future potentialities of the Corporation, provided always that we are permitted to proceed with our schemes on the lines which we have proved to be sound and in the best interests of the public we serve.

Replanning of the Gas Industry, to succeed, must be based on the existing structure; that is, if it is to come within the terms of reference of the Heyworth Committee—"to develop and cheapen gas supplies to all types of consumers."

The work that has so far been done by this Corporation, in spite of war conditions, is only an indication of what benefit the public can and will receive if we are not unduly hindered by bureaucratic control. In short, the planning can only be done by people who are wholly employed in the Industry, and thus are equipped with the necessary ability and experience.

The resolution was carried unanimously.

The retiring Directors, Mr. R. G. Simpson, Mr. Bruce Ottley, and Mr. M. H. Tetley, were re-elected, and the auditors, Messrs. Deloitte, Plender, Griffiths & Co., having been reappointed, the proceedings terminated.

The Manchester and District Junior Gas Association has arranged a Ladies' Day at Southport on June 30. While members visit the gas-works, the ladies will have an opportunity of visiting the Art Gallery and other places of interest.

Of interest to the Gas Industry is the award of the M.B.E. in the Birthday Honours to Miss Esta Eldod, Senior Press and Public Relations Officer to the Women's Royal Naval Service. First Officer Eldod left Radiation Ltd. to join the W.R.N.S. in July, 1940, and was appointed Press Officer to the Service in September of the same year. Her outstanding work in fostering and maintaining the high standard of the W.R.N.S. publicity has been recognized by the conferring of this award.

Sir Leslie Boyce, K.B.E., M.P. (Deputy Chairman of the Gloucester Gas Light Company), attended at the Gas Offices, Eastgate Street, Gloucester, on June 15, and presented Long Service Certificates and other tributes to two employees of the Distribution Department who had just retired. One of these, G. H. Baker, had been in the service of the Company as a gasfitter for 51 years. Sir Leslie, on behalf of the Directors, presented him with a Long Service Certificate, Gold Medal, and a cheque. The other employee, G. H. Harmer, served for 40 years, the last 27 years of which he was service inspector. He received a Long Service Certificate and Silver Medal. Mr. Baker was also presented with an armchair, and Mr. Harmer received a clock, both subscribed for by their colleagues. Sir Leslie, in making these presentations, congratulated the men on their fine record of service and wished them many happy years of retirement. Sir Leslie also made special reference to the fact that Mr. Baker's father had also served the Company for 51 years as a stoker at the Company's Hempsted Works—a record of 102 years for father and son.

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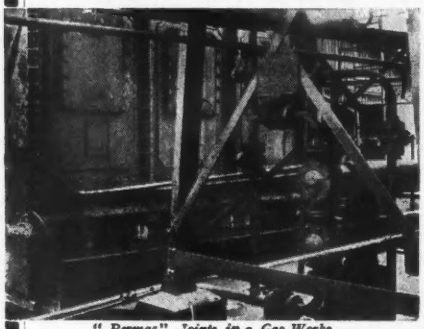

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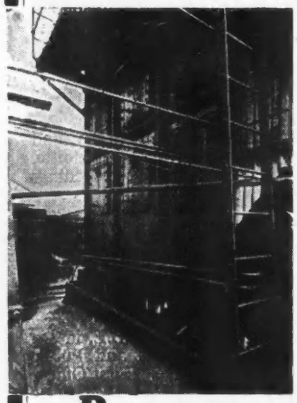

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Products Prices—Stocks and Shares

The London Market June 25.

As from March 5, by the Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), the maximum price of Pitch for briquetting has been increased to 60s. per ton f.o.r. supplying works, and the prices for Road Tar, as fixed by the Coal Tar Products Prices Order, 1943, S. R. & O. No. 1528, have been increased by one half-penny per gallon. There is also an increase of 5s. per ton in the price of standard Creosote/Pitch Mixture.

The only change to report in connection with the prices of Coal Tar Products is the coming into effect on June 11 of a new Government Order increasing the prices of Coal Tar Spirits. This Order is entitled the Control of Benzole and Coal Spirit Order, 1945 (S. R. & O. 1945, No. 681).

Control of Toluene (No. 4) Order, 1944 (S. R. & O. 1944, No. 170), contains an amendment of the Control of Toluene (No. 3) Order, 1943.

There is also the Control of Benzole and Coal Spirit (No. 2) Order, 1944 (S. R. & O., No. 988).

Coal Tar Products Prices (No. 2) Order, 1944 (S. R. & O., 1944, No. 1051), allows increases in the maximum prices for all forms of Naphthalene.

The Provinces June 25.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's. 2s. to 2s. 2½d., pure, 2s. 9d. (now controlled by S. R. & O. 1944, No. 988, operative from Sept. 1, 1944. Benzole and Coal Spirit, also Coal Tar Naphtha and Xylole, are now controlled by the Control of Benzole and Coal Spirit Order, 1944, dated Feb. 18, 1944, S. R. & O. 1944, No. 172, operative from March 1, and S. R. & O. 1944, No. 988, part I, operative from Oct. 1, 1944, Carbolic acid, 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943, Naphthalene now controlled under S. R. & O. 1944, No. 1051, operative from Sept. 22, 1944.

Attention is called to Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), referred to on p. 305, "JOURNAL" of March 7.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland June 23.

Throughput in the home market continues steady. Refined tar*: Yield to distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7½d. to 7¾d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

Stock markets were even quieter last week than during the preceding week, although the tone improved. Also it can be noted that despite the small volume of business, a steady investment support led to fractional gains iu the Funds, while home railway stocks were also firmer. Further favourable dividend announcements led to moderate inprovements among industrial equities.

The volume of business among gas stocks and shares was also on a small scale, but it will be seen below that with one exception the few price changes were all in an upward direction. It is satisfactory to record that Gas Light units, after a somewhat reactionary period, have commenced to improve again, while the Plymouth and Portsmouth companies' stocks also hardened. On enquiry Newport (Mon.) 5% debenture closed 5 points better.

The following were the changes for the week ending Thursday last:

OFFICIAL LIST		
Alliance & Dublin Ord.	114—119	—1
British 4 p.c. Red. Deb. (*x.d.*)	95—100	June 18
Gas Light Units	22/—23/—	+—/3d.
Plymouth Ord.	113—118	+1
Portsmouth Cons.	157—162	+2
Primitiva Holdings Ord.	12/3—13/3	+—/9d.
United Kingdom Gas Corporation 4½ p.c. 2nd Pref. (*x.d.*)	20/6—21/6	June 18
Wandsworth 5 p.c. Deb. (*x.d.*)	125—130	"
Ditto 4 p.c. Deb. (*x.d.*)	100—105	"
SUPPLEMENTARY LIST		
Brighton 5 p.c. Deb. (*x.d.*)	123—128	June 18
Cheltenham 4 p.c. Deb. (*x.d.*)	98—103	"
Guildford 4½ p.c. Red. Deb. (*x.d.*)	100—105	"
Newport (Mon.) 5 p.c. Deb.	120—125	+5
Reading 4 p.c. Deb. (*x.d.*)	97—102	June 18
Southampton 5 p.c. Red. Deb. (*x.d.*)	105—110	"
PROVINCIAL EXCHANGE		
Sheffield Cons.	151—153	+1

Arkon

INSTRUMENTS

Gas Flow Recorders and Indicators
Pressure and Vacuum Recorders and Indicators
Full Scale or Inclined Gauges

WALKER, CROSWELLER & CO. LTD.
CHELTENHAM, GLOS. Cheltenham 5172

GIBBONS BROS. LTD.

Gas and Constructional Engineers, Dudley. T/N Dudley 3141. T/A Gibbons, Lower Gornal.

Carbonizing Plant, Industrial Furnaces and Heat Treatment, Constructional Steelwork, Coal and Coke Handling Plants, Storage Bunkers, Reinforced Concrete Foundations.

MAVI

Gas Cookers, Fires, Radiators, etc.
Large-Scale Cooking Equipment

R. & A. MAIN, LTD.

LONDON AND FALKIRK

C. & W. WALKER LTD.

Midland Ironworks, Donnington, Wellington, Shropshire. T/N Wellington-Shropshire 12.

Makers of Gas-Works Plant of all descriptions.

WEST'S GAS IMPROVEMENT CO. LTD.

Miles Platting, Manchester 10. T/N Collyhurst 2961 (5 lines). T/A Stoker, Manchester. London Office: Columbia House, Aldwych, W.C.2. T/N Holborn 4108-9. T/A Wesgasco Estrand.

WEST'S CARBONIZING PLANTS.

GLOVER-WEST VERTICALS. WESTVERTICAL CHAMBERS.

Pegson's advertisement is out of this issue, but Pegson's Screens are IN with many a famous gas undertaking.

PEGSON LTD., Coalville, Leics.

ONX FIRE CEMENT

ANOTHER GAS COMPANY states on Nov. 27th, 1944:

"We are pleased to report on the satisfactory way your special Patching Cement stood up on a repair to the front wall of one of our settings. The repair was round the producer charging hole, having to stand up to the worst conditions being subject to the heat from the setting, abrasion of hot coke, and cold quenching water, and is still standing up well after three months.

Sets like a ROCK under heat

ONX 'SUPER 83' BRAND for RETORTS

A.L.CURTIS Westmoor Works CHATTERIS Cambs.

CRANE LTD

HUMIDINE

NON-SETTING PAINT

Used by the leading Gas Companies for the protection of the lower plates and cuppings of gas-holders. The most efficient anti-corrosion paint in existence

HUMIDINE NEVER DRIES, NEVER CRACKS AND IS ABSOLUTELY IMPERVIOUS TO WATER

OXY-GRAFITE PAINT

For the Protection against the corrosive effects of acid and alkaline fumes on all iron and steel-work of gasworks, Aspinalls Oxy-Grafite Paint is unsurpassable

Full particulars and prices on request from the sole proprietors

ASPINALLS (PAINTS) LIMITED

CARLETON — SKIPTON — YORKS

ERECTION WORK

GAS HOLDERS. OIL TANKS. STEEL BUILDINGS. CAST IRON TANKS. PURIFIERS. MAIN LAYING. PAINTING.

Sub-Contractors for any Erection Work,

REPAIRS, RE-SHEETING, DISMANTLING, & RE-ERECTION INSPECTIONS.

S. CROOKSTON & CO.

Contractors

GREATWORTH, BANBURY, OXON.

COMPRESSORS & EXHAUSTERS FOR AIR AND GAS.

See our Advertisement Next Week.

REAVELL & CO. LTD. IPSWICH.

Telegrams: PINCHBECK, HOLWAY, LONDON

PINCHBECK LTD.

Telephone: NORTH 2357

(ESTABLISHED 1844)

MANUFACTURERS OF SMALL CAPACITY— SLOT AND ORDINARY METERS

— ALSO —

SPECIALISTS IN LIGHT MECHANICAL AND ENGINEERING ASSEMBLIES

REPETITION TURNED WORK

SEND YOUR ENQUIRIES

ADAMS PLACE, GEORGES ROAD, HOLLOWAY, LONDON, N.7.

PLANT &c.

FIRTH BLAKELEY, SONS & CO., LTD. Vulcan Ironworks, Church Fenton, Yorks.

MANUFACTURERS of Gas-holders, Tanks, Condensers, Purifiers, Scrubbers, Washers, and every description of Gas Plant.

Sole Makers of the "P.M" semi-water Gas Plant.

Telegrams: "Blakeleys, Church Fenton."

Telephone: Barkston Ash 234 and 235 (Private Branch Exchange). Code: "Bentleys."

PLANT, &c. *(continued)*

ROBERT DEMPSTER & SONS, LTD., ELLAND, Builders of CARBONIZING PLANTS, both Horizontal and Vertical. Manufacturers of CONDENSERS, PURIFIERS, GAS-HOLDERS, &c., also every description of COAL and COKE HANDLING PLANT. *Telegrams:* "Dempster, Elland." *Telephone:* Elland 2241, 2242 and 2243.

PATENTS

MEWBURN, ELLIS & CO., CHARTERED PATENT AGENTS

AND TRADE MARK AGENTS

70 & 72, Chancery Lane, London, W.C.2.

Telegrams: "Patent, London." 'Phone: Holborn 0437

And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

KINGS PATENT AGENCY, LTD.

(Director, B. T. King, A.I.M.E., Patent Agent)

Advice, Handbook, and Consultations free. 146a, Queen Victoria Street, London, E.C. 4. Phone: City 6161

APPOINTMENTS VACANT

WANTED.—Home Service Adviser, trained in Domestic Science. Good Cookery Demonstrator and Lecturer. Preference Ex-H.M. Forces.

Applications, stating Age, Experience, Training, Certificates held and Salary required with *copies* of Testimonials by June 30, 1945, to Manager, East Hull Gas Company, St. Mark Street, Hull.

LEADING MECHANIC wanted immediately. Wages £6 10s. per week, and house at small rental, Apply stating Age, Experience, &c., to G. P. Mitchell, Managing Director, Worcester New Gas Light Company.

WANTED.—First class GASFITTER. Present Wages (including bonus) 2s. 0.21d. per hour. Motor Tricycle provided.

Application, stating Age, Experience and Qualifications to be addressed to the Engineer and Manager, Swadlincote District U.D.C., Gas Dept., Belmont Street, Swadlincote, near Burton-on-Trent.

STROUD GAS LIGHT & COKE COMPANY

MAINS AND SERVICE SUPERINTENDENT

APPLICATIONS are invited for the above Position at a Salary (inclusive of War Bonus) of £500 per annum.

Experience of High and Low Pressure Gas Distribution essential.

Candidates must possess Higher Grade Certificate of Institution of Gas Engineers (Gas Supply).

Applications to be received by the undersigned by July 2, 1945.

The Gas-Works, Canal Side, Stroud, Glos. F. B. WALLER, Engineer and Manager.

WANTED.—Experienced MAIN LAYER, perma-nent post. Rate of pay, including War Bonus, £4 7s. per week of 47 hours, plus participation in Co-partnership and Pension Fund.

Apply General Manager, Weston-super-Mare and District Gas Company, 32, The Boulevard, Weston-super-Mare.

BOROUGH OF DARWEN

(GAS DEPARTMENT)

DEPUTY ENGINEER AND MANAGER

APPLICATIONS are invited for the Position of DEPUTY ENGINEER AND MANAGER at a Salary of £390, rising, subject to satisfactory service, to £405 by one annual increment of £15, plus Whitley Council Scale of Bonus (at present £59 16s.).

The successful applicant will be considered for transfer to next higher grade of Whitley Council Scale if services satisfactory.

Applicants should be Chartered Gas Engineers with experience in the control of gas and by-product manufacturing processes, the maintenance of gas-works plant, and the control of men. Experience in the manufacture of Carburetted Water Gas, Benzole, and Concentrated Ammonia will be considered an advantage.

Applications, stating Age, present Position, Experience, Qualifications, and position with regard to the Essential Works (General Provisions) Order and Military Service, accompanied by *copies* of not more than three recent Testimonials, to be delivered to the undersigned not later than July 9, 1945, and should be endorsed "Deputy Engineer and Manager."

Town Clerk's Office, Darwen. CHARLES COUTTS BYERS, Town Clerk.

June 18, 1945.

APPLICATIONS are invited for the Position of ENGINEER AND MANAGER of the Shotley Bridge and Consett District Gas Company. Applicants must be qualified Gas Engineers and have experience in development of Sales. Salary based on Institution of Gas Engineers' scale.

Applications, enclosing *copies* of three Testimonials, stating Age, and position under the Essential Works Order and National Service Acts, to be addressed to the Chairman at Gas Offices, Thomas Street, Consett, not later than July 11, 1945.

BOROUGH OF STOURBRIDGE

(GAS DEPARTMENT)

INDUSTRIAL GAS ENGINEER

APPLICATIONS are invited for the Position of INDUSTRIAL GAS ENGINEER, at a Salary in Grade C, £290 to £335, plus cost of living bonus, at present £59 16s. Commencing figure will be fixed in conformity with the qualifications of the person appointed.

Preference will be given to applicants who have had experience in the use of town gas for glass manufacture.

Applications, stating Age, Qualifications, present position, together with information in relation to the Essential Works Order and Military Service, and endorsed "Industrial Gas Engineer," to be sent to the Town Clerk, Council House, Stourbridge, accompanied by *copies* of two Testimonials, not later than the first post on July 11, 1945.

Gas-Works, Stourbridge. S. J. D. WILLIAMS, Engineer and Manager.

June 18, 1945.

COLOMBO GAS & WATER COMPANY LIMITED

APPLICATIONS are invited for the Position of ASSISTANT DISTRIBUTION SUPERINTENDENT. Full particulars of this post can be obtained from the Secretary, Colombo Gas and Water Company, Limited, 148, Gresham House, Old Broad Street, London, E.C. 2.

APPOINTMENTS VACANT (*continued*)

COUNTY BOROUGH OF OLDHAM

(GAS DEPARTMENT)

SHOWROOM ATTENDANT

APPLICATIONS are invited for the appointment of a LADY SHOWROOM ATTENDANT, suitably qualified and capable of carrying out Demonstrations at the Showrooms or within the area of supply.

The position is graded £169-£197 12s. per annum, plus cost-of-living bonus as determined by the Council (at present 18s. 6d. per week). The commencing salary will be according to qualifications and experience.

Candidates should state their position under the Essential Works Order, and should indicate how soon they anticipate they could secure their release in the event of their appointment.

Conditions relating to appointments should be obtained from the Gas Engineer and General Manager, and applications endorsed "Showroom Attendant," stating age, qualifications and particulars of training, accompanied by *copies* of three recent Testimonials, should be forwarded to him at the Gas Offices, Greaves Street, Oldham, and received not later than first post of Monday, July 16, 1945.

Canvassing or submitting testimonials from members of the Council or of any Committee appointed by the Council will be a disqualification.

Town Hall, Oldham. THOMAS ALKER, Town Clerk.

June 22, 1945.

COUNTY BOROUGH OF SMETHWICK

(GAS DEPARTMENT)

APPLICATIONS are invited from persons possess-ing the necessary qualifications for the following positions:

COMMERCIAL SECRETARY.

Candidates must possess administrative ability, and have had experience in the duties of a similar office in a Gas Undertaking.

The commencing Salary will be in accordance with the qualifications of the person appointed and not less than £600 per annum, plus war bonus, which at present amounts to £59 16s. per annum.

CHEMIST.

A qualified Chemist, experienced in the technical control of a modern Gas Works plant with vertical retort installation.

Salary £400 per annum, rising by annual increments of £25 to £450, plus war bonus amounting at present to £59 16s. per annum.

The Appointments will in each case be subject to the provisions of the Local Government Superannuation Act, 1937, and to the successful candidates passing a medical examination.

Applications, stating age, qualifications, and experience, accompanied by *copies* of two recent Testimonials, should be addressed to the Gas Engineer and Manager, Gas Department, Rabone Lane, Smethwick, so as to be received not later than July 9, and should be suitably endorsed.

Council House, Smethwick. E. L. TWYCROSS, Town Clerk.

June 22, 1945.

COMPANY NOTICES

THE CROYDON GAS COMPANY

NOTICE IS HEREBY GIVEN that the REGISTER OF TRANSFERS in so far as it relates to PERPETUAL DEBENTURE STOCKS WILL BE CLOSED from the 30th June, 1945, to the 13th July, 1945, both days inclusive.

The interest for the half-year ending 30th June, 1945, will be remitted by warrant forwarded by post on the 13th July next to the holders registered on the closing of the books or their authorized agents.

Chief Offices: By Order of the Board.
Katharine Street, Croydon. WILLIAM HENRY HADDLETON, Secretary.

June 15, 1945.

THE GAS LIGHT & COKE COMPANY

NOTICE IS HEREBY GIVEN that the TRANSFER BOOKS of this Company, so far as they relate to CAPITAL STOCKS, WILL BE CLOSED at 4 p.m. on the 2nd July, 1945, for the half-year ending on the 30th June, 1945, and WILL BE REOPENED on the morning of the 2nd August, 1945.

Chief Office: By Order,
30, Kensington Church Street, W. 8. BRIAN WOOD, Secretary.

June 16, 1945.

PLANT &c. FOR SALE & WANTED

'PHONE 98 STAINES.

FOR SALE.—Cylindrical Receiver 30 ft. by 7 ft. dia.; 100 lb.; Cornish Boiler, 3,300 lb., evaporation 140 lb. w.p.; Weir Feed Pump 8¼ in. by 6 in. by 13 in.; Weir Feed Pumps (2) 5 in. by 3 in. by 6 in.; Weir Service Pump 6,300 g.p.h.; 7 h.p., 25 h.p., and 40 h.p. Crossley Gas Engines; Tangye 3-Throw Ram Pump 5 in. by 8 in.

HARRY H. GARDAM & CO., LTD., STAINES.

ANVILS. New, All-steel, London Pattern, for sale from stock. In sizes 28 lb. to 3½ cwt. Very keen prices. Ask for leaflet.

GEORGE COHEN, SONS & CO., LTD., Wood Lane, London, W. 12. Telephone: Shepherds Bush 2070.

FOR SALE.—LANCASHIRE BOILERS, pair of 30 ft. by 8 ft. dia., by Yates & Thom, Ltd., 1911; complete Fittings; handfired; re-insured 160 lb. Clean reports. Also 30 ft. by 8 ft. 6 in. for 160 lb. Others from 12 ft. to 30 ft. by 6 ft. 6 in. to 9 ft. dia., 100/200 lb. pressure. CORNISH, VERTICAL and LOCO. type; various sizes and pressures. Complete installations anywhere. BOILER STORAGE TANKS, all sizes. Enquiries solicited.

RATCLIFFE, "Boiler Exchange," Hawarden, Chester. (Hawarden 3118.)

TWO Gas-Engine-driven Electric GENERATING SETS for immediate sale, in excellent condition. Full particulars on application to the Gas Company; Worcester.

FOR SALE.—One Bell type Retort House Governor with 16 in. connexion complete excepting for governor bell.

One Bell type Retort House Governor with 18 in. connexion complete excepting for governor bell.

Stretford and District Gas Board, Longford Road, Stretford, Manchester.

FOR SALE.—Four Oxide Purifiers made by Drakes, Halifax. 12 ft. by 12 ft. by 4 ft. 6 in. deep, dry seal type, 6 in. connexions. Capacity 250,000 cu.ft./day.

Apply, Fuel Research Station, Blackwall Lane, Greenwich, S.E. 10.

CONTRACT OPEN

CITY OF PERTH CORPORATION

(GAS DEPARTMENT)

MAINLAYING

TENDERS are invited for EXCAVATING AND RE-INSTATING TRACKS for 935 yards of 15 in. diameter and 1,333 yards of 12 in. diameter GAS MAINS through busy thoroughfares in the City.

Forms of Tender, Specification and General Conditions may be obtained on application to the undersigned.

Tenders, in sealed envelopes, endorsed "Tender for No. G.4.45/E.7.45. Mainlaying Contract," should be received by R. Adam, Esq., O.B.E., Town Clerk, City Chambers, High Street, Perth, not later than Wednesday, July 18, 1945.

The Corporation do not bind themselves to accept the lowest or any Tender.

Gas Offices, Friarton, Perth. W. NICOL BAIRD, Engineer and Manager.

June 19, 1945.

EDUCATIONAL

AUTHORITATIVE CORRESPONDENCE TRAINING

T.I.G.B. Students have gained 29 FIRST PLACES and Hundreds of Passes in the Examinations for A.M.Inst.C.E., A.M.I.Gas E., A.M.I.Chem.E., A.M.I.Mech.E., A.M.I.E.E., C. & G., etc.

Qualify Now by Home-Study with the T.I.G.B.

The Department of Fuel Technology covers **Gas Supply, Gas Engineering, Gas Power, Engineering,** and the **Certificates of The Institution of Gas Engineers.**

Write to-day for "Engineer's Guide to Success"—FREE—containing the world's widest choice of engineering courses—over 200—and which alone gives the Regulations as to admission to various examinations such as A.M.I.Gas E., A.M.Inst.C.E., A.M.I.Mech.E., A.M.I.Chem.E., C. & G., &c. The **T.I.G.B.** guarantees training until successful.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN

148 TEMPLE BAR HOUSE, LONDON, E.C. 4

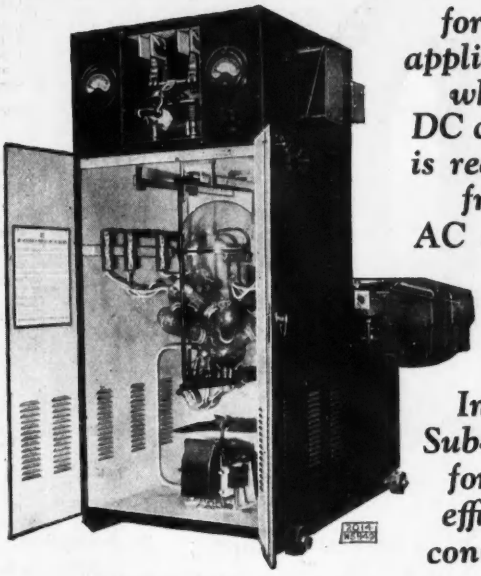
PUBLICATIONS

GAS ACCOUNT CALCULATORS

SUPPLIED either by Price per Therm or Thousand, for any specified Calorific Value, in book form, office charts, or pocket charts for Meter Inspectors, printed in clear type. Write for particulars to F. H. WAKELIN, LTD., Calculator Specialists, 354, WHEELER STREET, BIRMINGHAM.

'Phone: Northern 0989. 'Grams: Reckoners, B'ham.

Mercury-Arc Rectifiers

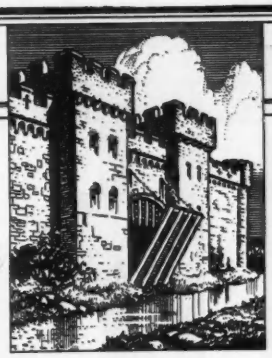


for all applications where DC current is required from AC supply

Indoor Sub-station for high efficiency conversion

Completely self-contained, with AC and DC circuit-breakers, meters and control gear. Automatic voltage control to maintain voltage at pre-set figure for all loads

The **ELECTRIC CONSTRUCTION Co.** Ltd.
WOLVERHAMPTON



PROTECTION

GAUNTLET

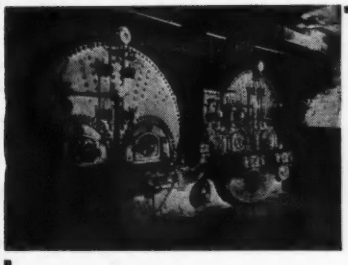
GAUNTLET
WEATHER TESTED PAINTS

ARCHD H. HAMILTON & CO. LTD
27-37 BARDOWIE STREET POSSILPARK GLASGOW N

EXHAUST HEADS

MUFFLE THE NOISE OF ESCAPING STEAM
AND
PREVENT DISFIGUREMENT AND ROTTING OF BUILDINGS BY MOISTURE AND GREASE

HOLDEN & BROOKE LTD.
SIRIUS WORKS, MANCHESTER 12
AND
66, VICTORIA ST., LONDON, S.W.1



THE
TURBINE FURNACE
has a reputation for
FUEL ECONOMY
BOILER EFFICIENCY
and the ability to give
LARGE STEAM OUTPUT
with
ALL CLASSES OF FUEL

THE
TURBINE FURNACE Co. Ltd.
238b, Gray's Inn Road,
London, W.C. 1.

LEAD

LEAD PIPES: Chemical Compo.; Improved Tellurium-Lead Pipes specially recommended for their unique resistance to vibration, frost, corrosion, creep, friction and other strains of service.

LEAD SHEETS: Guaranteed high purity Chemical Sheet Lead a speciality. Ordinary, Antimonial, Tellurium and Ternary qualities also supplied.

SOLDER: Tinman's, Plumbers', Blowpipe. To B.S.S. and any specification.

PAINTS: White Lead and Red Lead—as Paste Paint ground in oil and Ready Mixed for use in qualities suitable for all coats from priming to finishing. Also supplied Tinted.

Restrictions on the use of Lead for new and repaired building work have been withdrawn, and Sheets, Pipes, Flashing, Traps, Bends, etc., can now be used for this purpose.

ASSOCIATED LEAD MANUFACTURERS LTD

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Locke, Lancaster and W. W. & R. Johnson & Sons Ltd • Walkers, Parker & Co., Ltd.
The Cookson Lead and Antimony Co., Ltd • Foster, Blackett & James Ltd.
The Librex Lead Co., Ltd.

LIMPSFIELD COURT, OXTED, SURREY • CRESCENT HOUSE, NEWCASTLE-ON-TYNE • LEAD WORKS, CHESTER

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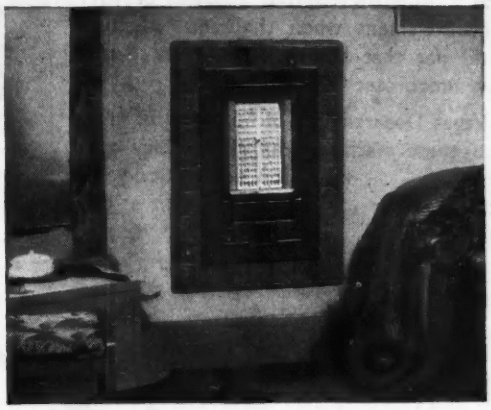


PORTCULLIS "PORTELLO" GAS FIRE

Design of unusual merit associated with advanced technical efficiency will continue to be characteristic qualities of the products of Bratt Colbran when peace-time manufacture is resumed.

Bratt Colbran Limited

Ten, Mortimer Street, London, W. One

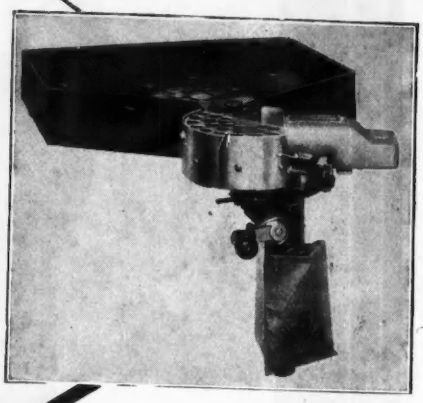
MAKERS OF THE PORTCULLIS RANGE OF PRODUCTIONS

THIS MACHINE COUNTS FOR YOU!

How can any business which deals daily with large numbers of coins do without a counting machine? Is it fair to your business or your employees to rely on the human element when thousands of coins must be counted daily? Could not that human element be better employed doing other and more important work?

Many Gas Companies and the Wages Departments of hundreds of firms depend entirely on the service these machines can give. They are, in the first place, absolutely accurate . . . they stop automatically on £5 worth of silver and 5/- worth of copper . . . and they count at the rate of a 1,000 coins per minute.

All over the world these counting machines are proving their worth.



Also manufacturers of
ENVELOPE OPENING and ENVELOPE SEALING MACHINES

INTERNATIONAL COIN COUNTING MACHINE CO. LTD.
COLLEGE ROAD, CHESHUNT
Phone: Waltham Cross 3241–2

E. C. & J. KEAY, LIMITED

CONSTRUCTIONAL ENGINEERS AND IRONFOUNDERS,

Head Office:
6, Corporation St.,
BIRMINGHAM

C.I. PURIFIERS RECENTLY SUPPLIED AND ERECTED

London Office:
25, VICTORIA STREET,
S.W.1

Southampton:
21, PORTLAND STREET

Specialists in **TANKS**, Steel or Cast-Iron, Riveted or Welded

THROUGHOUT the war, North British Rubber Conveyor Belts have been piling up long service records . . . adding steadily to the reputation for dependability that has given them pre-eminence.

Thanks

The North British Rubber Company Limited acknowledges a debt of gratitude to the loyal army of maintenance engineers who, recognising the difficulties attending the supply of all forms of manufactured rubber, have co-operated so well in the task of prolonging belt life. The resultant saving in rubber, in man-power, in resources, has been most appreciable . . . and is well appreciated.

THE UTMOST CARE IS STILL VITAL

★

Points to remember to prolong belt life

Keep your belts dry and clean as possible.

Rollers and Idlers should be well lubricated, but keep oil away from belt.

Load belts as evenly as practicable.

Avoid accumulation of material under the belt, or between belt and rollers.

Every step you take to ensure smooth travel adds to service life.

THE NORTH BRITISH RUBBER COMPANY LTD • EDINBURGH & LONDON

MANUFACTURERS OF

North British

RUBBER CONVEYOR BELTS

Pre-eminent wherever conveyors are used

FOR INTERNAL TRANSPORT IN MINES, MILLS AND FACTORIES

RW/C6

Gunite is PROTECTION against abrasion

Gunite—concrete applied by air pressure—has numerous applications where its great density and extreme adhesion have particular value.

For lining coal bunkers and steel chimneys it is an ideal material, possessing great resistance to corrosion and protecting steel-work from the abrasive action of the raw coal.

For repairing reinforced concrete it has particular merit, as, due to the method of application, a uniform density and adherence is obtained in whatever place the Gunite is applied, thus overcoming the common fault with hand-placed methods.

CONCRETE PROOFING CO. LTD.
100 · VICTORIA ST · S·W·1

'Phone: Victoria 7877 & 6275
'Grams: Prufcrete, Phone, London

Write to W·B E G about it!

Our facilities cover a wide range of Metal Pressings, Hot Brass Pressings and Brass Machining.

We can design and make anything from a tooth-pick holder to a miner's lamp!

We shall like to hear what *your* particular problem is!

WE WORK IN ALL METALS AND TO MOST SPECIFICATIONS

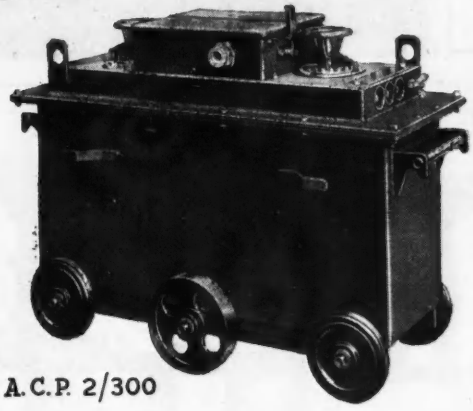
WRIGHT BINDLEY & GELL LTD
PERCY ROAD, BIRMINGHAM, 11

Quasi-Arc
REG. TRADE MARK

WELDING·EQUIPMENT

Transformer Welding Sets

In addition to the comprehensive and well-known range of Quasi-Arc Welding Electrodes, there is also a wide range of Welding Sets, suitable for either A.C. or D.C. supply. Where an electric supply is not available, petrol or diesel engine-driven sets can be supplied. Below are illustrated two of the more popular Transformer Welding Sets.



A.C.P. 2/300

Portable oil-cooled set with A.C. output for two welders, each 300 amperes, or one at 600 amperes. Conversion from two- to one-welder set by simple switch.

Dimensions are 21 in. × 50 in. × 39 in. high. Weight, with oil, 11½ cwt.

A.C.P. 150

Portable air-cooled set with 150 amperes output, recommended for general repair and light production work. Fine current regulation by simple handwheel control from 15/75 amperes at 120 volts and 30/150 amperes at 60 volts. Dimensions are 19 in. × 14 in. × 22 in. high. Weight 2 cwt.

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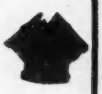

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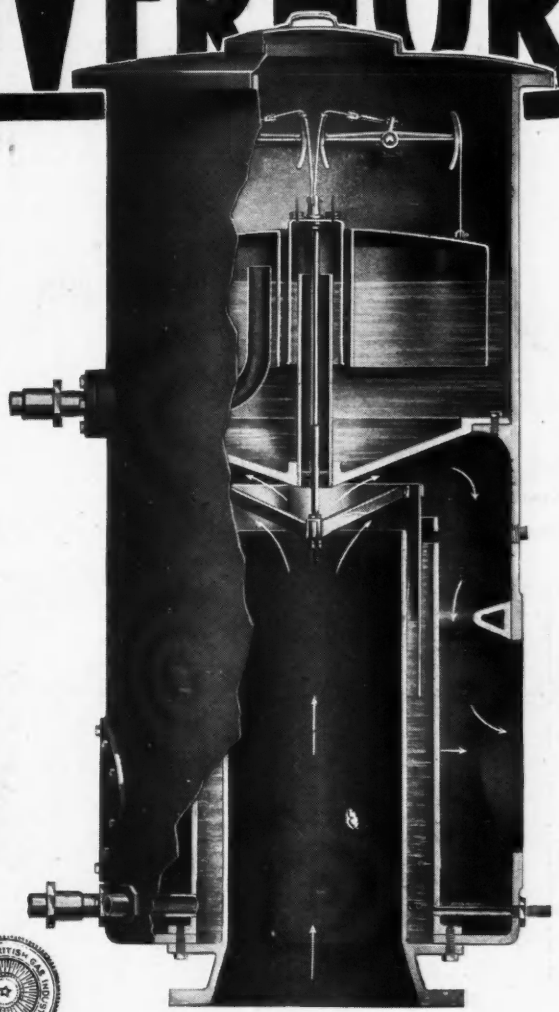

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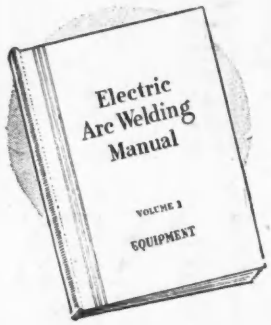

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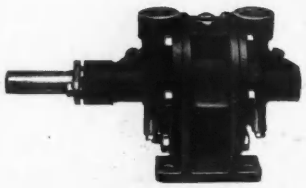

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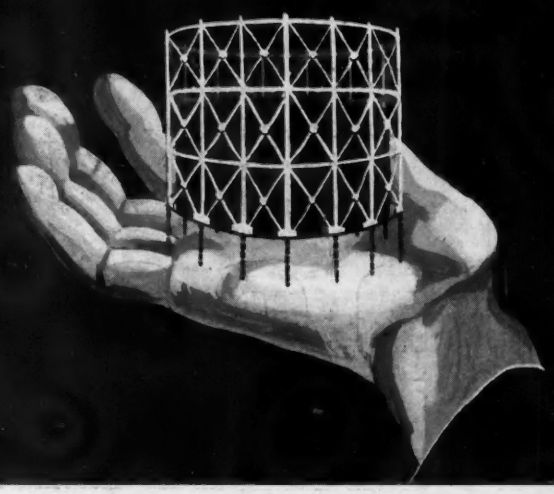

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